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Some Observations on the Control of Communicable Diseases

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THE later years of Edward Jenner's life were somewhat embittered, it is said, because he had failed to realize the limitations of vaccination. He had failed to realize, until the truth was forced on him by others, that re-vaccination is a necessary supplement to vaccination in the control of smallpox. The necessity for taking cognizance of the limitations of our methods is thus not new.

When regulations in regard to notification, isolation of cases and quarantine of contacts of communicable diseases were formulated under the Health Acts of the various provinces, it was anticipated that a fair measure of control would be achieved by their application. The results in many ways have been disappointing. For instance, the reported morbidity rates for diphtheria and scarlet fever in Ontario remained practically on a level for thirty years. We do not know whether these levels of the morbidity rates were maintained in spite of some measure of control or through the lack of control. We do not know whether, or by how much, changing diagnosis, more complete reporting through public health and school nurses, etc., may have obscured actual control. Neither do we know what degree of control it was right to anticipate, as adequate controlled observations to determine that were not made. There are thus serious limitations, not only to our practices, but to our knowledge on which practice has been based. It is better to recognize these limitations and if possible improve on them, rather than continue either belief or practice which will be the object of criticism in the future.

The situation is much the same in the case of measles and whooping cough. No one would have sufficient faith in the recorded morbidity rates

of either to make any comparison of the past and present through that medium. The mortality rates, however, holding well to those of over thirty years ago, do not give any suggestion that control has been achieved. Such direct comparison of mortality records is admittedly rash and of questionable value as even these, over the years, are subject to many influences apart from mortality actually due to the specific causes. The present volume of recorded mortality in itself, however, in both whooping cough and measles, indicates the need for much better control than has been obtained. With the reported morbidity of diphtheria and scarlet fever and the reported mortality of whooping cough and measles lacking any evidence that the application of the regulations of notification, isolation and quarantine has achieved any significant measure of control, a stock-taking of our usual practices is indicated. Everyone realizes the importance of promptly reporting the first case of typhoid fever in a community and of smallpox and the opportunity that gives for really effective action and actually controlling an epidemic. Everyone realizes how the tuberculosis case, at large among his associates, seeds the infection in them and perpetuates the disease. But there is good justification today for questioning the general results obtained by notification, isolation, placarding, and quarantine in diphtheria, scarlet fever, whooping cough, and measles. Most cases have probably done their large share of spreading before they are brought under surveillance.

No one today would doubt the efficacy of diphtheria antitoxin. The decline in diphtheria mortality, in the pre-toxoid period, to perhaps 25 per cent. of its early rates in spite of a level morbidity rate is generally, and probably rightly, attributed to the wide use of antitoxin. But this means of control of mortality itself was entirely inadequate. Diphtheria remained, until the last decade, in every province of Canada, the chief cause of death in the age group 2-14 years of age. The essential lack of control was evident in the return of the mortality rate in 1920 to the high level obtaining early in the century. Even this efficient agent, diphtheria antitoxin, had, therefore, very serious limitations in the actual control of the diphtheria mortality, in spite of the fact that clinically a diagnosis of diphtheria is made relatively easily, that the causative agent can be identified in most instances in a few hours, that the disease is at first a local disease, allowing some time for treatment before such treatment becomes useless, and that there has been free and unlimited distribution of antitoxin in Ontario since 1916. Such apparent ease of diagnosis and opportunity for reasonably early and thus satisfactory treatment do not obtain in many other acute infections. The limitations found in diphtheria antitoxin as a means of control of diphtheria mortality at least suggest that, in so far as control of the public health problem is concerned, similar or greater limitations are inherent in specific therapeutic treatment of other acute infections in which the diagnosis is not so readily made and the time of useful or most advantageous treatment much shorter. For instance the public health authority could hardly anticipate adequate *control* of either poliomyelitis or pneumonia through such specific therapeutic treatment, whether or not such treatment be of value in the individual case.

Through the wide use of diphtheria toxoid efficient control of diphtheria has been achieved. It goes back little more than a decade, but it is already an old story. In spite of the striking degree of control achieved through diphtheria toxoid it is imperative that we recognize its limitations and the limitations of our knowledge in regard to it. One limitation we know is that even after three doses of toxoid, there may be some diphtheria. In the Toronto Public School children given three doses of toxoid from 1927 to 1932 there should have been, had they contracted diphtheria at the same rate as their seat mates who had not been given toxoid, 460 cases. There were not 460 cases, but there were 40 cases—less than 10 per cent. of the rate in controls, it is true, but nevertheless an indication of the limitation of even three doses of toxoid.

We do not know exactly the duration of immunity following three doses of diphtheria toxoid. If we maintain efficient control we may never learn that. But we do know that the immunity is highest soon, in the first year, after receiving toxoid and that it tends to fall. We do not know exactly how much immunity (as shown by antitoxin level) can fall before it can be said to be lost, but we do know that there has been a death from diphtheria in a six-year-old child given three doses of toxoid five years previously. Even three doses of toxoid, a prophylactic through the use of which efficient control and, in many places, complete elimination of diphtheria have been already achieved, has thus its limitations. Knowledge of its limitations may justify a change in procedure; perhaps a regular course of immunization in the first year of life—because the pre-school group supplies one half of all diphtheria mortality—and another dose at the beginning of school life may be required. The practice of the future must be determined as knowledge of the value and limitations of the present practice is accumulated. No one, of course, would use these limitations as an excuse or reason for putting off immunization until greater perfection is attained. Probably the greatest limitation of diphtheria toxoid is to be found today in the lethargy, apathy and inactivity of ourselves. If these were overcome the solution of the limitations previously mentioned might well constitute a problem of the future and not of today.

From the wide use of scarlet fever antitoxin and scarlet fever toxin in nurses and patients in many hospitals in Canada, the United States and England it can be said with fair assurance that scarlet fever can be controlled to a large extent in these institutions. There are fewer records of its use in community work. The fear of reactions to prophylactic antitoxin, to therapeutic antitoxin and to toxin has been a serious limitation to their wide use. In this connection the experience of Dr. G. Murray Fraser, Medical Officer of Health of Peterborough, Ontario, may be quoted. Peterborough, a town of 25,000, suffered an extensive epidemic of mild scarlet fever during the winter of 1937-38. With public interest thus sufficiently aroused, Dr. Fraser offered immunization with scarlet fever toxin to the school children. He warned parents that some reaction might be anticipated. There was a gratifying response, 1327 children starting immunization and 1149 children completing the 5 doses. There were not any severe reactions, or any that gave rise to alarm, although

many transient sore arms, headaches, nausea and vomiting were reported. In fact the reactions to toxin were much less than the reactions to prophylactic antitoxin especially among the older children. The subsequent Dick Test showed a very large percentage to be Dick-negative in contrast to those tested previous to immunization, where 75 per cent. were found Dick-positive. As the immunization and the epidemic progressed together it is difficult to estimate its efficiency in controlling scarlet fever. From the commencement of the immunization campaign, however, to the end of the epidemic there were 5 cases in children receiving one or more doses of toxin (3 had received 5 doses) and 46 cases in the balance of the school population of 3900. Dr. Fraser considered that immunization was a definite factor in controlling the epidemic and decided to continue scarlet fever immunization as part of his community program.

Dr. Somerville's experience in the Turner Valley outbreak in Alberta was substantially the same. "There was little objection," he says, "on the part of the parents to the number of inoculations or the occurrence of reactions. . . . In general the reactions are much more marked than in the administration of diphtheria toxoid but it is the tediousness of the long series to which most parents object."

The case fatality rate of scarlet fever is low, but the volume of mortality does not represent the whole problem in scarlet fever. There is the prolonged morbidity, the 10 per cent. incidence of otitis media and the 1 or more per cent. incidence of mastoiditis. Other sequelae are probably of importance. If through actual field experience such as that in Turner Valley, Peterborough and other places, one of the serious limitations of scarlet fever prophylaxis, namely fear of reactions, can be overcome, and the value of the method convincingly established, the way will be opened for the wider use of an agent of which we can afford to learn much more. It is on such field experience that practice and methods must be built and it is from such that the efficiency, and the limitations, of any method or agent must be determined.

Dr. William Warwick showed beyond question of doubt the value of convalescent or recovered serum in the prophylaxis of measles in an institution in Saint John, New Brunswick. The limitations of this agent, in a community or province-wide program lie, to some extent, in the difficulty of obtaining or providing such serum. It is a simple limitation which will be overcome when the demand for the serum is sufficient. When one thinks of the high cost and relative scarcity of convalescent or recovered poliomyelitis serum in contrast to recovered measles serum, of the very conflicting or unfavourable evidence of the value of the former in contrast to the proven value of the latter, but the speed with which "polio' serum" can be made available in case of an epidemic, one cannot but wonder why the general use of measles convalescent or recovered serum should be so long delayed. As 65-75 per cent. of measles deaths are in the first three years of life or in institutions, the field for useful application of serum is readily defined.

In whooping cough prophylaxis the new vaccine prepared from freshly isolated strains and made from smooth colonies has very definite promise.

The figures of Pearl Kendrick, in Michigan, and Silverthorne in Toronto, as well as others, are, to say the least, impressive. In over 1500 children given the vaccine in Michigan and nearly 800 in Toronto there was a reduction of 70-90 per cent. in the incidence of whooping cough as compared with that in controls, in spite of definite known exposure. These data thus approach conclusiveness, or are, as stated, most impressive. But Dr. J. A. Doull in Cleveland used the vaccine in approximately 400 children and kept an equal group of controls under observation in what was probably the most detailed and most carefully conducted experiment to date. Doull found no difference whatever in the incidence of whooping cough in the two groups. It is impossible at present to reconcile, satisfactorily, the discrepancy between his observations and those of Kendrick and of Silverthorne. Any suggestion of explanation would be speculation. The final evaluation of the efficacy and of the limitations of this agent must await further investigation and to this evaluation the man in the field can make the most valuable contribution.

The lack of agreement of the value of convalescent serum in the preparalytic stages of poliomyelitis is well known. In spite of the early encouraging results from widely scattered parts of the world, supported by the best laboratory evidence of that time, repeated controlled observations have failed to show the value of this treatment. Probably the most recent of these studies has been made in the Hospital for Sick Children in Toronto. In this institution convalescent serum was used under well-controlled conditions. There was no evidence obtained to indicate that it was of value. On the other hand the observations on the use of serum throughout the province, and indeed throughout all the provinces, favour it. Unfortunately, similar good results have been reported when sera of varied and very questionable sources have been used. If, in order to satisfy demand, poliomyelitis recovered serum is to be distributed, there would seem to be every justification for the simultaneous distribution of a control serum in order that the question may be settled beyond possible doubt.

Elimination of Smallpox in Montreal by Vaccination*

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SMALLPOX vaccination occupies an outstanding place in any discussion of our present methods for the control of communicable diseases by immunization. The experience of the City of Montreal may be of interest as exemplifying the value of vaccination in the control of smallpox.

In Montreal not a single case of smallpox has been reported during the last ten years. I may add that since 1904, when all children were required to be vaccinated before entering school, we have not experienced a serious outbreak of that disease. Sporadic cases have occurred but in most instances those affected were unvaccinated persons who had recently come to the city.

In order that a picture of the accomplishments of the control of smallpox by vaccination in Montreal may be presented, the deaths from this disease since 1872 have been reviewed. The data are given in table I in five-year periods, with the average population for each period and the average number of deaths from smallpox. The rate per 100,000 population, using the average number of deaths for each period and the average population, is also presented.

TABLE I

SMALLPOX IN MONTREAL, 1872-1938
AVERAGE NUMBER OF DEATHS AND RATE PER 100,000 POPULATION

Year Periods	Population	Number of Deaths	Rate per 100,000 Population
1872-1874	123,072	590.3	478.0
1875-1879	133,468	583.6	451.2
1880-1884	146,992	29	21.3
1885-1889	190,359	646.8	387.5
1890-1894	226,539	0	—
1895-1899	265,594	2.8	1.0
1900-1904	288,943	5	1.7
1905-1909	359,190	0	—
1910-1914	473,276	1	.1
1915-1919	607,000	0.2	.3
1920-1924	681,850	0	—
1925-1929	711,560	0	—
1930-1934	827,185	0	—
1935-1938	879,000	0	—

The early history of vaccination against smallpox in Montreal is of interest. It is reported that anti-variolic vaccination according to Jenner's method was introduced into the Province of Quebec in 1801 by an artillery officer named Lathan who was stationed at Quebec City. A great many years

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elapsed, however, before vaccination was used extensively. The reason for this was the antagonistic attitude of the public, the newspapers, and the medical profession, due to the accounts of numerous and severe complications and of the failure to protect because of the frequent use of vaccinal lymph of poor quality. Smallpox epidemics were of serious proportions and from the beginning of the nineteenth century a number of serious outbreaks were recorded, some having a very high fatality rate. In the decade beginning with the year 1870 outbreaks of virulent smallpox occurred, causing great alarm. The yearly incidence of deaths between 1872 and 1889 is illustrated in figure 1.

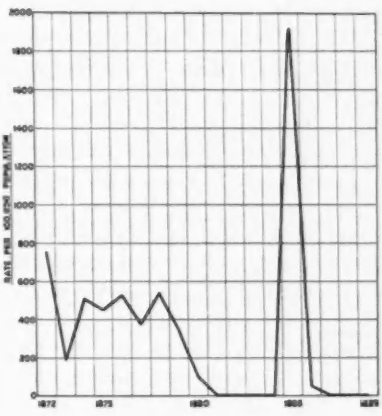

FIGURE 1

MORTALITY FROM SMALLPOX IN MONTREAL, 1872-1899.

The exceedingly high mortality from smallpox at this time and in the following decade aroused public opinion and the question of vaccination as a means of the prevention and control of smallpox was prominently before the public. On October 20, 1876, Dr. William H. Hingston, a prominent surgeon, then mayor of Montreal and chairman of the Board of Health, convened a meeting of the medical profession and urged that prompt measures be taken to prevent smallpox, saying: "It is a fact that smallpox has raised the mortality rate in this city, which is detrimental to its good reputation and to trade. It is therefore very urgent that efficacious measures be resorted to." He pleaded in favour of widespread vaccination and the result of the meeting was that many physicians took an active part in the efforts to prevent smallpox by vaccination. Physicians were appointed as public vaccinators and a stricter control was established, with the result that only five deaths from smallpox were reported in 1881 and no deaths during the following three years.

This, unfortunately, was only the calm before the storm. In 1885 Montreal experienced the worst and most deadly outbreak of smallpox ever recorded in any city in Canada. The number of cases reported was 4771. The number of deaths was 3164, giving a rate of 1888 per 100,000 population. That many cases were not reported is shown by the fact that the case fatality rate as determined from these figures would be 66. In 1938 my colleague and assistant, Dr. E. Gagnon, published in the Canadian Public Health Journal a short account of this epidemic, to which I would refer those who desire further details.

By the close of 1885 the whole population of Montreal had been either vaccinated or revaccinated. The memory of this terrible epidemic prompted

people to have their children protected by vaccination early in life. The effect was at once evident and not one death from smallpox was recorded until 1897. During that year 12 deaths occurred and around the turn of the century twenty-five more were reported. The last death from smallpox in Montreal was reported in the year 1918.

In 1887, two years after the great epidemic, legislation was passed by the Province of Quebec making it obligatory that all children over three months of age be vaccinated. After this legislation was passed, the City Council of Montreal adopted three by-laws for the purpose of enforcing its requirements. By-law number 324, passed in November 1904, proved to be effective and has been strictly enforced. In addition to providing for better preventive measures, this by-law enacted that a child cannot be admitted to school or a person be employed in a commercial or industrial establishment unless he produces a certificate attesting that he has been successfully vaccinated. Parents, teachers, and employers are made responsible for the observance of this by-law. Severe penalties for failure to comply with the requirements of the by-law are provided.

As soon as this by-law was passed, physicians were detailed to visit schools and commercial and industrial establishments to make sure that its provisions were observed. It took many years to obtain the full co-operation of all concerned. Persuasion and education, rather than coercion, have been the methods employed by the Department of Health in the enforcement of the by-law. At first, many teachers and employers were reluctant to comply with the legislation. A certain number of "conscientious objectors", so-called, have been encountered. Firmness, repeated notices, sometimes a warning of prosecution, exclusion from school or work, have gradually subdued all resistance.

The number of vaccinations performed since 1905 is presented by five-year periods in table II.

TABLE II

NUMBER OF PERSONS VACCINATED AGAINST SMALLPOX IN MONTREAL, 1905-1938

Year Periods	Number of Vaccinations	Yearly Average
1905-09	18,489	3,698
1910-14	17,091	3,418
1915-19	29,545	5,909
1920-24	53,991	10,798
1925-29	51,571	10,314
1930-34	130,497	26,099
1935-38 (4 years)	81,786	20,446

Since 1872, when four physicians were appointed as public vaccinators, vaccination has been made available by the Department of Health without charge. Vaccination was conducted at first in the homes, but as the organization of the Department of Health grew, a physician was assigned to conduct public vaccination and to issue certificates in the Department offices. During the past twenty years free vaccination has also been offered to the publicin

all baby health centres. These centres, situated in all parts of the city, are operated either by the City or by voluntary agencies. The vaccine virus was supplied by the Department of Health without charge. During the summer holidays parents are advised through the newspapers and the churches that children will not be admitted to school unless they are able to produce a vaccination certificate.

Two physicians of the Department of Health visit commercial and industrial establishments to confirm that all individuals employed therein have been vaccinated. Dairies and food establishments are visited at least once a year and other establishments at longer intervals.

A year ago it was felt that as the importance of vaccination was so deeply impressed upon the public and so well accepted by them, it was opportune to limit the extent of the free vaccination services, placing in the hands of the medical profession at large a greater share of this work. It was decided that only destitute persons would receive free vaccination from the city or other public agencies. Those who are considered able to pay for this service are advised to apply to their family physician. Physicians are supplied with vaccine virus without charge by the Department of Health. I can speak most highly of the discretion and the tact of the members of the staff of the Department of Health in the application of this new rule. As a result, the public was not occasioned any hardship and the effectiveness of the work has not been impaired in the least.

In summarizing the measures which have been employed to protect the population in Montreal, I would like to emphasize that vaccination is the only reliable preventive measure against smallpox. Vaccination also may well be considered harmless. In making this statement, I speak from knowledge of the fact that since 1905, 382,970 persons have been vaccinated by the Department of Health of Montreal and in only a very few instances have there been reports of serious illness following vaccination. To control smallpox there must be effective legislation to require vaccination at an early age, and at the same time there must be enforcement of the law through proper municipal by-laws. Such enforcement requires the inspection of all pupils at the beginning of the school year and the exclusion of unvaccinated children; the requirement of a vaccination certificate from all those employed in industry, commerce and transportation, and also from teachers and all those whose occupation brings them in constant contact with the public. It is essential that vaccine virus be of proper quality and that it be distrbuted free to physicians for use in their practice. There must be a continuous program of public education presenting the facts about vaccination. Official records must be kept by the Department of Health of all vaccinations made by any official or voluntary agency. In the event of an epidemic of smallpox, free vaccination should be offered to the whole population by the Department of Health in order that every person may have the protection of vaccination at the earliest possible moment. I am convinced that the strict application of these measures will result in the disappearance of smallpox, as has been demonstrated in Montreal.

The Application of Phage Typing to Strains of *B. typhosus* Recovered from Typhoid Fever*

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IT is now generally accepted that the Vi or V form of *B. typhosus* which develops the Vi or virulence antigen, is the significant form in human infection. Apart from the evidence provided by the immunological studies of Felix and his co-workers and others, it has been found that nearly all freshly isolated strains of *B. typhosus* are V forms (1, 2). Craigie and Brandon ventured the opinion that failure to isolate the V form was probably due to the presence of V bacteriophage in the specimen of origin. No serological differences in the V agglutinogen of *B. typhosus* have been demonstrated. Of particular interest to the epidemiologist is the discovery by Craigie and Yen that different V form types could be distinguished by means of their reactions to preparations of type II Vi phage. They found that this phage developed a high selective affinity for the type of strain on which it was grown. Such phage preparations, used in high dilutions determined by standardization tests, could be used to identify strains similar to the strains used for the growth of the phage. The authors claimed that these phage-demonstrable types were, within the limits of their observations, stable on repeated subculture or mouse transfer and that the epidemiological evidence pointed to a similar stability on human transfer. It is obvious that if extended observations substantiate this claim the epidemiologist has at his disposal a sensitive and serviceable tool. The method devised by Craigie and Yen is a simple one and it would appear to the writer that, having mastered a few refinements of technique, any bacteriological laboratory can apply the bacteriophage typing of all types of *B. typhosus*.

Application in the Study of two Epidemics

The experience of phage typing as applied in the investigation of two typhoid-fever epidemics, showing entirely different epidemiological pictures, is presented herewith. The technique employed was that described by Craigie and Yen (3).

The first epidemic was a prolonged outbreak of 19 cases with 3 deaths. The epidemic lasted from October 18 to December 25, 1937.

Clinically the cases varied greatly, only two showing marked intestinal symptoms. Many of the cases were difficult to diagnose and were not reported for several weeks.

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Dates of onset of the cases were as follows:

Case Number		*Case Number*	
1, 2	October 18	11	November 24
		12	November 27
3, 4	October 25	13, 14, 15	December 4
5, 6	November 15		
		16	December 10
7	November 16	17	December 15
8, 9	November 20	18	December 16
		19	December 25
10	November 22		

Six of the patients were males and 13 were females. Their ages ranged from 16 to 52 years. There were no instances of more than one case in a family. The patients were all strangers to one another and lived in different parts of the city although the majority lived in a better-class section. A few had made out-of-town trips and most of them had had meals in restaurants throughout the city. One patient (no. 8) whose onset was on November 20 was a fisherman living on a houseboat in a sewage-polluted inlet. He sometimes used the sea water for washing purposes and he may have been infected from this source. Sixteen of the other patients remembered having eaten cooked crabmeat which was eventually traced to two butcher shops. The shops had purchased the cooked and shelled crabmeat directly from a fisherman who operated on a float anchored near the houseboat of patient no. 8. The crabs were caught in these polluted waters but were well boiled before being shelled and extracted aboard his float. *Although the cooked crabmeat was washed in city tap water obtained from the shore in buckets, the utensils themselves sometimes became contaminated with sea water* This then was a possible source of contamination. With this clue a 50-cc. sample of sea water taken by one of our sanitary inspectors was submitted to the Provincial Laboratory for examination. In addition to the usual tests a special study was conducted which resulted in the isolation of *B. typhosus*. The shellfishing was stopped on December 15th and within ten days the last typhoid case occurred.

The strains isolated from some of these cases and from the water sample were studied in some detail by the writer at the Connaught Laboratories, Western Division.

From the water, three strains were recovered. These were, respectively, type E_1, type A, and an imperfect V form strain resistant to type II phage. Stools, blood, and urine cultures from 12 of these cases were studied, with the following findings: 6 patients yielded a type A strain (1 patient died and 1 case was so mild that the patient had to be confined to bed for only 2 days); 1 patient yielded a type D strain; 2 patients yielded a type E_1 strain; 1 patient

yielded a type G strain (this patient died); 1 patient yielded a type H strain; and 1 patient yielded an imperfect V form strain consistently and remains a chronic carrier.

In 1936 Foley, Faille, and Brandon (4) pointed out that an epidemic showing a mixture of enteric cases, including cases of typhoid fever, paratyphoid fevers (Alpha and Beta), and dysentery, results from sewage contamination. It is now suggested that when a typhoid epidemic yields cases infected by more than one or by different phage types of *B. typhosus*, the epidemic has probably resulted from sewage contamination.

The second epidemic was an explosive outbreak in an inland city of 1300 population. It involved 36 cases with 2 deaths. All the cases had consumed raw milk from one dairy. No cases occurred amongst those who had not consumed this milk, although there were two other large and a number of small milk producers in the city. The epidemic began September 27, 1938 and ended (with the exception of 3 secondary cases) on October 12, a week after the dairy was ordered to cease the distribution of milk.

Clinically, these cases differed from those of the first epidemic in that the onset generally was sudden with high fever, violent diarrhoea, cramps, and vomiting. Through the excellent co-operation of the Division of Laboratories of the British Columbia Board of Health, typhoid bacilli were isolated from most of the single stool or blood specimens submitted in the early stages of the disease. All the cultures isolated were found to be type F_2 strains.

Up to the time of this epidemic we had not isolated an F_2 strain in British Columbia. From this epidemic there will probably be 3 or 4 chronic F_2 carriers who will require supervision to prevent them leaving a trail of F_2 cases behind them.

These epidemics are only examples to show how these newer bacteriological tools can help the epidemiologist in investigating sources of infection. With the co-operation of a good laboratory the epidemiologist can now record all typhoid carriers known to him according to the type of the typhoid bacillus present, a proceeding which might prove of value when a subsequent epidemic occurs.

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The Low Mortality Rate from Tuberculosis in the Jewish Race*

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AS far back as 1911 the reports of the Health Department of the City of Montreal have classified the deaths from the most important causes, according to the racial origin of the population, which for this purpose is divided into four groups: French, British, Jewish, and all other races.

The Jewish group has always shown a decidedly lower rate than all others not only in mortality from all diseases but also from tuberculosis. During the last twenty years the average mortality rate from tuberculosis among the Jews has been only 40 per cent. of the rate for the entire population for this disease. If comparison had been made between the rate for the Jewish population and the rate for the rest of the population, the difference would be even more accentuated.

These are facts which are not easily explained. In the absence of specific statistical and pathological data, I am inclined to believe that the following factors may account for at least a part of the wide differences in the rates.

1. The returns of the last census showed that close to 60 per cent. of the Jewish population of Montreal is foreign-born, having migrated into this country, for the most part, since the beginning of this century. These immigrants were medically examined before entering the country and they constitute a select group as far as health is concerned. It is very likely that many cases of latent or inactive tuberculosis have been admitted, but open or active cases have not entered, with the result that the sources of contamination were, at the start, less numerous than amongst the native part of the population.

2. The Jewish group of the population has very limited social relations with other groups. It is true that Jewish children are educated with Protestant children, but open tuberculosis at school age is exceptional and the danger of infection in the school may be considered negligible. Contacts in work-shops with active and open cases of tuberculosis may be more frequent, but this is not considered a source of infection as dangerous as the continuous and intimate contact in family life.

On the other hand, as marriages between Hebrews and Christians are an exception, the family contact is limited to people of the same race; and if we admit that, on account of their selection at their entry into Canada, tuberculosis must be less prevalent in the Jewish families, we may conclude that the dangers of dissemination are also lessened.

**Presented before the Section of Vital Statistics and Epidemiology at the twenty-eighth annual meeting of the Canadian Public Health Association, Toronto, June, 1939.*

3. The low mortality rate may also be due to the fact that the Jewish community is the ethnical group provided with the best means of protection against tuberculosis. They have more beds per caput in hospitals and sanatoria than any other group and while their number represents only about 6 per cent. of the total population, the amount of money subscribed by them for public charities exceeds 18 per cent. of the total of all subscriptions. The Jewish destitutes are therefore much better provided for than any of the other groups of the population. The greater number of beds available to them, for a population in which tuberculosis is apparently less prevalent, allows the early segregation of the contagious cases and impedes the spreading of the disease.

4. Occupation plays an important part in the spread of tuberculosis. The Jewish population is almost exclusively an urban one, and 95 per cent. of those living in the Province of Quebec are located in the city of Montreal and the surrounding municipalities. According to the last census the proportion of the gainfully employed of both sexes in various occupations is as follows: 66 per cent. equally divided between manufacturing and commerce, and 22 per cent. equally divided between service and clerical work, in contrast with 63 per cent. for the total of the gainfully employed in Montreal, under the same headings. The proportion of the Jewish population employed in unskilled labour is only 2.5 per cent. in contrast with 15 per cent. for the whole population.

It follows that only a very small proportion of the Jewish population is occupied in heavy outside work. Nearly all those working in factories are employed in the manufacturing of clothes, wearing apparel, furs, etc., which are classified as light manufacturing. There are no heavy pieces to handle, the machinery is electrically operated, the greatest part of the work is done in a seated position, and the operations require skill and ability rather than physical exertion. Moreover, all this work is done indoors, where the worker is less affected by variations in the outside temperature. An abnormally large proportion of the employed are owners, managers or supervisors of manufacturing establishments and owners of small trading shops.

5. If outside of the above facts we take into consideration that the Jew does sacrifice luxuries for the necessities of life; that he allows himself a wholesome, varied and abundant diet; that he abstains from the abuse of alcoholic beverages; that he is mentally inclined to take good care of his health and to seek early treatment for his ailments and those of his family; that his family is of a medium size—only 10 per cent. of the Jewish families have more than four children—thus restricting the danger of contamination in the home, one may reach the conclusion that such conditions are sufficient to explain in a great measure the difference in the death rate from tuberculosis.

In the absence of data for a more detailed study of this problem, we were inclined to believe that there was no other explanation, until recently, when our attention was called to an article entitled *Le Problème de la tuberculose chez les Juifs*, published in 1934 in the Revue de Phtisiologie by Dr. E. Arnould, Director of the Metallurgical and Mining Association for the Control of Tuberculosis, of Paris.

After an analysis of the various statistics published on this subject, Dr. Arnould comes to the conclusion that it must be admitted that tuberculosis mortality among the Jewish population is, and has been for a great many years, less than half that obtaining amongst the non-Jewish population. To try to find out the reason for so great a difference, Dr. Arnould made a very comprehensive study of the numerous publications on this subject, in countries and cities where people of Jewish origin form an important part of the population, such as Poland. He concludes:

1. Tuberculosis morbidity, revealed either by clinical observation or by the tuberculin test, is only slightly less in the Jewish than in the Christian population.

2. The development of the disease amongst the Jews is much slower than amongst Christians. In the former a case of tuberculosis would, on the average, end in death after eight or nine years, while in the latter death occurs in about five years.

Seeking an explanation for these facts, Dr. Arnould does not think that they are the result of better living and working conditions, as, in Europe specifically, the great mass of the Jewish population is living in the worst sanitary conditions. He is rather inclined to believe that resistance to illness—not only to tuberculosis but also other communicable diseases such as measles, scarlet fever, diphtheria, and whooping cough—has been acquired from hardships suffered by that race through the past centuries. He points out that since immemorial times the Jewish people have always lived in towns and that of all the racial groups they constitute the most exclusively urban population. As far back as the Middle Ages the Jewish people had to struggle against the deplorable living conditions of the poor in the urban communities. Those who were unable to adapt themselves to such conditions disappeared. The survivors have transmitted to their descendants a resistance to unfavourable conditions, increasing from one generation to another. These conditions were of two kinds: the first were engendered by poverty and its consequences—underfeeding, crowded dwellings, uncleanliness, etc.; the others came from microbial diseases and more particularly tuberculosis. Dr. Arnould thinks it reasonable to deduce that, through the ages, biological modifications have been acquired which confer on the Jewish group a degree of natural immunity to various diseases which is not shared by other ethnical groups.

I admit that, so far, we have not gathered for the Jewish population of Montreal any specific data permitting discussion of these conclusions. I am not prepared to say that the living conditions of the Jewish people are as bad in this country as in Europe; I rather think they are far better. But this may not be sufficient to account for the wide difference in mortality rates for tuberculosis, and this paper, in my mind, opens new horizons to be studied.

Abstracts of Papers from the Christmas Meeting of the Laboratory Section, Toronto, December 18-19, 1939.

A Study of Methods for Detection of the Presence of Coliform Organisms in Water. (Report of the Committee on Bacteriological Examination of Water and Sewage)

—N. J. HOWARD, *Department of Public Health, City of Toronto;* A. G. LOCHHEAD, *Department of Agriculture, Ottawa;* and M. H. MCCRADY, *Ministry of Health of Quebec, chairman.*

THE value of the brilliant-green bile method of confirming lactose-broth presumptives in the bacteriological examination of water samples was demonstrated by observations made in a number of laboratories in Canada engaged in

TABLE I

COMPARISON OF THREE METHODS FOR DETECTION OF THE PRESENCE OF COLIFORM ORGANISMS IN WATER

Type of water	Number of samples with presumptives	Number of lactose-broth presumptives	Number of coliform isolations from lactose broth	Number with gas in confirmatory brilliant-green bile	Number of coliform isolations from brilliant-green bile
HAMILTON					
Raw	27	136	116 (4)**	131	115 (5)**
Applied	6	6	1	1	1
Filtered	1	1	0	0	0
Finished*	58	62	0	0	0
	92	205	117 (4)	132	116 (5)
MONTREAL					
Brooks	4	38	36 (1)	37	37
Lakes	6	40	27 (7)	30	30
Springs	23	180	143 (19)	162	154 (3)
Wells	24	137	101 (5)	108	96 (3)
Filtered	2	10	7 (1)	8	6 (1)
Filt-treated	3	13	10	10	10
Treated	5	24	3 (1)	4	2 (1)
	67	442	327 (34)	359	335 (8)
OTTAWA					
Wells	29	194	148 (11)	171	153 (5)
Springs	4	33	16 (6)	28	21 (1)
Others	3	16	8 (3)	11	11
	36	243	172 (20)	210	185 (6)
TORONTO					
Raw	11	67	48 (3)	61	50 (1)
Filtered	12	55	41 (2)	53	42 (1)
Finished	7	15	3 (3)	13	6
	30	137	92 (8)	127	98 (2)
Total	225	1027	708 (66)	828	734 (21)

*Hamilton's finished water figures represent the results of examination of 2 portions of 25 cc. each of about 600 samples.

**The figures in parentheses represent the number of tubes from which coliforms were not isolated, but from the corresponding lactose broth (or bile) tubes of which, coliforms were isolated.

the routine bacteriological examination of water. The findings indicate that this rapid confirmatory method is quite as satisfactory for the detection of coliform organisms in water as the more involved "completed test". The application of the "completed test" to brilliant-green bile gas positives yielded a number of coliform isolations that compares very favourably with the number obtained by applying the "completed test" directly to the lactose-broth presumptives. The results confirm those previously reported by a large group of American and Canadian laboratories and suggest that the brilliant-green bile confirmatory procedures may be satisfactorily employed in the bacteriological examination of the great majority of Canadian and American waters.

TABLE II

COMPARISON OF THREE COLIFORM METHODS IN PERCENTAGE OF SAMPLE PORTIONS SHOWN, BY TWO ISOLATION PROCEDURES, TO CONTAIN COLIFORM ORGANISMS

Laboratory	Number of lactose-broth presumptives shown, by the use of two methods, to contain coliforms	Gas in brilliant-green bile transfers	Coliforms isolated directly from lactose broth	Coliforms isolated from brilliant-green bile gas positive transfers
		Per cent. of column 1	Per cent. of column 1	Per cent. of column 1
Hamilton	121	109 per cent.	97 per cent.	96 per cent.
Montreal	361	99 " "	91 " "	93 " "
Ottawa	192	109 " "	90 " "	96 " "
Toronto	100	127 " "	92 " "	98 " "

TABLE III

COMPARISON OF COMPLETED TEST AND BRILLIANT-GREEN BILE SECONDARY FOR CONFIRMATION OF LACTOSE-BROTH PRESUMPTIVES*

Samples	Completed Test				Total
	+	−	+	−	
	Gas in B.G. Bile				
	+	−	−	+	
Rivers	34	1	1	1	37
Creeks	5				5
Mountain streams	18		2		20
Lakes	10				10
Pools, tanks, etc.	4	1			5
Springs	3	6			9
Wells	115	20	2	7	144
	189	28	5	8	230

*Alberta Laboratory.

Preliminary Report on Vi Antigen Agglutination as a Routine Diagnostic Test—V. CROSSLEY, JEAN MACALPINE, and HELEN CONWAY, *Division of Laboratories, Department of Health of Ontario.*

EIGHT hundred and seventy sera submitted for the routine macroscopic agglutination test for enteric infections or for blood culture, were tested with antigens prepared from two Vi variants of *S. typhi,* namely, Vi I and S 107.

Of these, 52 agglutinated *S. typhi* H antigen. These represented 26 known cases of typhoid fever. Twelve of these cases (46 per cent.) failed to show agglutination with either of the Vi antigens at the time they were submitted. Further specimens were not received from these cases. Where several specimens were received from a patient over a considerable period of time, it was possible to demonstrate the presence of Vi antibody, although the time of its appearance and disappearance seemed to vary considerably.

Of 18 patients who had received typhoid-paratyphoid vaccine, 12 showed no agglutination of the Vi antigen. Six showed some agglutination of S 107 and 2 of Vi I.

Of 23 sera showing agglutination of *S. paratyphi B* antigen, none agglutinated Vi I, but one agglutinated S 107. However, as this sera also showed a fractional amount of *S. typhi* H antibody, this patient may have received typhoid-paratyphoid vaccine.

It was not possible to set up the dilutions for Vi agglutination below 1:25. Owing to the wide routine, the available amount of sample was limited. A recent change in our outfit for collecting these samples will make available a larger amount of serum and thus permit study with dilutions from 1:5 upward.

From our observations, the Vi antibody is demonstrable in the serum of typhoid fever patients during so short a period of time that the use of Vi antigen in the routine macroscopic agglutination test for the diagnosis of typhoid fever adds very little to the present method of H & O agglutination and blood culture.

This preliminary report will be followed by a further study on known carriers and vaccinated individuals.

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Further Observations on Types of B. Typhosus—JAMES CRAIGIE, *Connaught Laboratories and School of Hygiene, University of Toronto.*

(a) *The Use of Type IV Vi Phage in the Preliminary Test*

A MIXTURE of type I and type IV Vi phages, rather than type I alone, is now recommended for the recognition of V form cultures preliminary to typing. The plaques produced by type I phage on some type A and type E strains of *B. typhosus* may be particularly small, necessitating the use of a high concentration of phage to produce confluent lysis. Type IV phage is fully active,

and produces normal plaques on type A and type E strains, while type F and some other strains, insensitvie or partially resistant to type IV phage, are fully sensitive to type I phage

(b) *New Types of B. typhosus*

Since the last report (1), only one new type of *B. typhosus* has been encountered in Canada. This, as yet, is represented only by a single strain from a sporadic case. Two new types have been reported from China by Yen (2). Two new subtypes of types B and D have been recognized as the result of a detailed comparison of strains from the epidemics in which they occurred. The differentiation of these B and D subtypes, sensitive to phages B_2 and D_2 respectively, illustrates the sensitivity of the indirect method of phage analysis. In this method, type II phage is propagated on the strains under examination and the resultant phage preparations are analyzed by differential titration on the various type strains. While this method makes possible a finer degree of differentiation than the simpler method of typing the strains by application of standard phages, further observation will be necessary to determine the significance of the minor differences thus demonstrated. In this connection the isolation of both subtypes F_1 and F_2 from a stool specimen (3) is important.

(c) *The Stability of Types of B. typhosus*

No epidemiological evidence of type variation of *B. typhosus* has been encountered although further instances have been encountered of the reversion of the imperfect V form excreted by a carrier to a typical V form in active cases infected by him. Very extensive investigation of the type strains by repeated subculture and single-colony isolation have yielded only one instance of change of type. Here a type A colony was isolated from a plating of type B_1. The following typical V forms (A, B_1, B_2, C, D_1, D_2, E_1, and F_1) and some imperfect V forms have been mouse-passed under various conditions. With one exception, the phage reactions of the strains remained unaltered. From one mouse, which died after inoculation with type C in the course of an immunity test, a type C culture which showed a minor alteration in its phage reactions was recovered from the heart blood. Sixty single-colony isolations from subculture were examined and one of these proved to be type A. The position of type A, it should be noted, remains obscure. This type is peculiar in being fully sensitive to all preparations of type II phage. The recovery of an unstable type C strain from a mouse inoculated with an imperfect V form strain has been previously reported (4). From one of numerous platings of type strain C, an imperfect V form colony was isolated but this has not yet been repeated. Excluding variation in the direction of type A or the imperfect V form and also the single instance of the association of two subtypes in a single specimen (3), no evidence of type variation (change of type within the range of types B, C, D, E, F, G, H, and J) has been obtained.

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Two Phage-Susceptible Types of B. Typhosus isolated from a Case of Typhoid Fever—DOROTHY E. HELMER, DONNA E. KERR, C. E. DOLMAN, and L. E. RANTA, *Division of Laboratories, Provincial Board of Health of British Columbia, and Western Division, Connaught Laboratories, University of Toronto, Vancouver.*

CRAIGIE'S method of differentiating V forms of *B. typhosus* in terms of their specific phage-susceptibility has proved a very useful public health laboratory procedure. The method has made earlier identification of colonies possible, and has also on several occasions provided important epidemiological information.

Recently, an isolated case of typhoid fever occurred in an adult male, in a small British Columbia town. Type F_1 *B. typhosus* was isolated by blood culture at an early stage of the illness. A stool specimen received at the same time also proved positive. From a bismuth-sulphite agar plate showing numerous colonies of *B. typhosus,* nine colonies were picked, and tested for phage-susceptibility. All colonies proved susceptible to type F_2 phage at the critical dilution. Six of the colonies were also lysed by a type F_1 phage, used at the critical dilution for this preparation, while the remaining three colonies proved resistant to F_1 phage used in relatively high concentrations. In other words, stool culture yielded both F_1 and F_2 types of *B. typhosus,* the former apparently preponderating. These findings were verified by preparing, from single plaques, type II phages effective against cultures of the F_1-resistant colonies. The resulting preparations gave the properties of F_2 phage, thus indicating conclusively that the colonies in question were of F_2 type.

A later stool specimen, obtained eight days after the patient's discharge from hospital, yielded a total of twelve colonies on several plates, all of which proved of type F_1. A careful epidemiological enquiry failed to disclose any obvious source of infection. The patient had received liberal doses of sulphanilamide for seven days prior to collection of the first stool specimen. Incidentally, he showed no "H" or "O" agglutinins, when tested on several occasions between one and twelve weeks after onset of the illness, against standard typhoid suspensions, although agglutination was shown by the patient's serum against suspensions prepared from his own strain.

The Specificity of Typhoid and Paratyphoid Vaccines—M. H. BROWN and A. J. BISHOP, *Connaught Laboratories and School of Hygiene, University of Toronto.*

THERE is no experimental evidence to support the contention that a potent typhoid vaccine may protect man against paratyphoid B or paratyphoid A infection. The evidence presented suggests that the protection conferred by typhoid, paratyphoid B, and paratyphoid A vaccines is specific.

Cross-Immunity and Enteric Infections—A. R. FOLEY, *Ministry of Health of Quebec,* and J. PAQUIN, *County Health Unit of Nicolet, Que.*

REPORT of the case of a man having had a paratyphoid B fever and a typhoid fever consecutively, each disease being diagnosed clinically and serologically, with identification of the causal organisms.

A Serological Study of Streptococci—HELEN PLUMMER, *Connaught Laboratories and School of Hygiene, University of Toronto.*

BY use of the precipitin test, 97 per cent. of 874 strains of streptococci isolated in Canada, most of which were haemolytic, were placed in one or other of the seven groups of Lancefield. No members of groups H or K of Hare were isolated. Of these strains, 699 were from human beings and 175 from animals.

Of 373 beta haemolytic strains obtained from pathological conditions in human beings, 360 belonged to group A. Of 13 strains remaining, 10 were classified as follows: 2 from cerebrospinal fluid of cases of meningitis, 1 from the sputum of a case of broncho-pneumonia, 1 from the urine of a case of pyelitis, 1 from the prostatic secretion of a case of arthritis, and 1 from the larynx of a case of laryngitis belonged to group B; 1 from the cervix of an atypical case of puerperal sepsis, to group C (type B_2); 1 from the nose of a person with an antrum infection, to group F; 1 from the throat of a case of tonsillitis and 1 from the cervix of an atypical case of puerperal fever, to group G. Three strains not classified were as follows: 1 from a throat infection, 1 from pus from a lung abscess, and 1 from a blood infection.

Of 258 strains from the throats of contacts of infection, 199 belonged to group A and 59 to group B (50 of these were from an institution already reported by Plummer 1935). Of 68 strains from the throats of normal individuals, 22 belonged to group A, 17 to group B, 7 to group C (types B_1 and B_2), 2 to group F, and 13 to group G. Six were unclassified.

Of 175 strains from animals, 3 belonged to group A, 101 to B, 47 to C, 3 to D, 2 to E, and 19 were unclassified. The group A strains were from the milk of cows, two of which were incriminated in an epidemic of sore throat. Group B consisted of 98 strains from mastitis in cows, 1 from the brain of a rabbit in which smallpox vaccine tests were being carried out, and 2 from the milk of apparently normal cows. Group C consisted of 40 strains of type A (lactose-positive, sorbitol-positive, trehalose-negative) from foxes, ferrets, guinea-pigs, horses, cows, rabbits and mice; 2 strains of type B_1 (lactose-

negative, trehalose-positive, sorbitol-negative) from horses; 1 strain of type B_2 (lactose-positive, trehalose-positive, sorbitol-negative) from a horse; 3 from the milk of cows with mastitis, and 1 from dairy milk. Group D consisted of 1 strain from the eye of a ferret, 1 from contaminated vaccinia virus, and 1 from the milk of a cow with mastitis. Group E consisted of 2 strains from the milk of cows with mastitis. Of the 19 unclassified strains, 9 were from the milk of cows with mastitis, 1 from a sow with mastitis, 4 from lymphadenitis in guinea-pigs, and 5 from the milk of apparently normal cows.

By means of the slide agglutination test, 93 per cent. of 520 group A strains were placed in one or other of 19 of Griffith's types. The high percentage of strains typed was probably due to the fact that no strain was considered untyped until 15 subcultures had given negative results. It was found impossible to distinguish between types 17, 23 and 26 and also between types 19 and 27. No strains belonging to types 8, 10, 22 and 30 were isolated.

Of 77 strains from sporadic cases of scarlet fever, 18 (23 per cent.) belonged to type 1, 15 (20 per cent.) to type 2, 16 (21 per cent.) to type 3, 8 (10 per cent.) to type 4, 7 (9 per cent.) to type 11, and the remaining 13 to 8 other types. Of 210 strains from other infections, consisting of 35 from tonsillitis, 4 from mastoiditis, 17 from otitis media, 29 from meningitis, 17 from pneumonia, 10 from peritonitis, 5 from abscesses, 15 from wounds, 2 from skin blebs, 7 from erysipelas, 37 from puerperal sepsis and 32 from other pathological conditions, 19 (9 per cent.) belonged to type 11, 19 (9 per cent.) to type 13, 19 (9 per cent.) to type 17-23-26, 17 (8 per cent.) to type 12, 17 (8 per cent.) to type 2, 14 (7 per cent.) to type 1, 13 (6 per cent.) to type 3. Seventy-one fell into other types and 21 remained untyped.

By means of type-specific precipitin tests for group B strains, described by Stableforth (1932) and Lancefield (1934), 92 per cent. of 183 strains were placed in one or other of Stableforth's types 1, 3, 4a and 4b. Since it was found impossible to distinguish, by means of precipitin tests, between his types 2 and 3, these strains were placed in type 3 because they were also found to be members of Lancefield's type 3 which is related to if not identical with Stableforth's type 3. Of the 106 strains from the milk of cows with mastitis 43 (40.6 per cent.) belonged to type 1, 42 (39.6 per cent.) to type 3, 2 (1.9 per cent.) to type 4a, and 8 (7.5 per cent.) to type 4b, the remaining 11 strains being untyped. Three strains from human beings were not typed, the remaining ones being distributed throughout types 1, 3, 4a and 4b.

During the preparation of cultures for extracts for precipitin tests and for the absorption of agglutinins pigment was sometimes noted. In these experiments cultures were grown in 100 to 200 cc. amounts of 10 per cent. serum broth for 24-48 hours at 37°C., centrifuged, the bacterial sediment washed with saline, suspended in 2-4 cc. of saline, allowed to stand at room temperature overnight, and then inspected for pigment. If present, the colour ranged from a tinge of yellow to deep red. Strains of groups A, C, E, F and G showed no pigment whereas 122 (67 per cent.) out of 183 group B strains and 3 out of 6 group D strains were pigmented.

Viability of Haemolytic Streptococci in Stock Cultures—ROY FRASER, *Department of Biology and Bacteriology, Mount Allison University, Sackville, N.B.*

A METHOD is described for maintaining prolonged viability of stock cultures of haemolytic streptococci by the use of the author's blood-gelatin stock culture medium. The method has proved to be easy and dependable for routine work, and has been of value in maintaining both viability and virulence in some strains which showed poor viability by ordinary methods.

The Influence of Blood in Culture Media—FREDERICK SMITH, *Department of Bacteriology and Immunity, McGill University, Montreal.*

ADDITION of blood to culture medium does not always enhance its growing qualities. Plasma is bacteriostatic for certain organisms, erythrocytic for others. Both inhibitory qualities are neutralized in the neighbourhood of growing staphylococci, giving the satellite phenomenon. Some strains of haemolytic streptococci grow poorly or not at all on blood agar, except near staphylococcal colonies, where both growth and haemolysis are increased.

An Investigation into a High Count of Pin-point Colonies in Pasteurized Milk—W. H. BURTON, *Newbould Laboratories, Guelph.*

AN investigation into the occurrence of high counts following pasteurization is outlined. Inspection showed that the raw milk from two producers had high counts of thermophilic organisms. It was found that milking machines were used on these farms and that the contamination of the milk occurred in the milking machines. Samples of milk received from the milking machines were inoculated into sterile milk, incubated, and plated. These infected samples of milk were then pasteurized and counts were again made. There was little or no decrease in the counts after pasteurization and the organisms present were similar to those isolated from the pasteurized milk obtained from the dairy. Phosphatase tests were negative on all pasteurized samples. The high count of pin-point colonies in the milk on arrival at the dairy was considered to be the result of the contamination of the milking machines by thermophilic organisms.

Some Improvements in the Preparation of Staphylococcus Toxoid—R. J. WILSON, *Department of Hygiene and Preventive Medicine, University of Toronto.*

THIS paper presents further observations on the preparation of more potent staphylococcus toxoids by formol detoxification than have been hitherto described. Some discrepancies formerly demonstrated in values obtained by the two in vitro methods of measuring the α antigen during the study of the mechanism of formol detoxification (1) have been further investigated. Certain data are presented in support of the fact that the in vitro values are, on the whole, a measure of the ability of these preparations to produce circulating anti-

bodies in vivo. Some limitations encountered in the use of rabbits as experimental animals to determine the relative antigenic potencies of any series of staphylococcus toxoids are discussed.

EXPERIMENTAL

In light of the findings presented in a former paper, detoxification of the exotoxic filtrates of the staphylococcus was carried out by adding sufficient formalin to give a final concentration of 0.5 per cent. and by maintaining the filtrates at 0°-5° C. Detoxification was completed in 100 days. The drop from an initial value in the toxin of 60.0 Lf's per cc. to 50.0-52.0 Lf's per cc. at the time of detoxification is in marked contrast to the drop in the control sample kept at 37°C., in which the time of detoxification was 4 days and the final value 12.0 Lf's per cc.

The α antigen is unstable to a temperature of 37°C. even after complete conversion to toxoid. A sample of toxoid W. 11-1 containing 50.0 Lf's per cc. was incubated at 37°C. After 1 day the value was 30.0 Lf's per cc., and after 20 days, 4.0 Lf's per cc. This destruction proceeds with equal rapidity at pH 6.5 and pH 8.0.

Contrary to findings formerly reported, the Lb and Lf values maintained a constant ratio throughout the process of destruction of the α antigen. The stability of the Lf value at a lower level, as previously reported, was due to the zone of the α antigen merging with and passing through a stable second zone as yet unidentified. The occurrence of this phenomenon was not recognized until recently. This second zone is very wide, and tends to obscure the end-point of the α antigen-antibody flocculation. The Lb value of a toxoid is higher than the Lf value, the ratio being Lb/Lf = 1.3-1.4. The toxoid W. 11-1 described above had an initial value, Lb = 70.0 S.U. per cc., Lf = 50.0 S.U. per cc., and after 13 days' incubation at 37°C., Lb = 9.0 S.U. per cc., Lf = 7.0 S.U. per cc. This is presented as further evidence in support of the contention that the flocculation reaction is an accurate and specific method of measuring the content of α antigen in a toxin or in a toxoid. The discrepancy in values given by the two tests is undoubtedly due to the small amount of α haemolysin added as an indicator in the Lb method.

Several groups of eight rabbits were given a series of subcutaneous injections of toxoids of various Lf values. The weekly measurement of the circulating α antibodies produced in these rabbits yielded data which showed that while no constant quantitative relationship was maintained, the toxoids with the highest Lf and Lb values produced the highest titres of circulating α antibodies in vivo. Thus the values obtained by in vitro titration of the α antigen may be used as indices of the relative abilities of any series of filtrates to produce circulating α antibodies in vivo.

In using rabbits as experimental animals for in vivo testing of the relative antigenic potencies of a series of staphylococcus toxoids, it must be remembered that the level to which the circulating α antitoxin will rise in rabbits is limited in general to 6 or 8 standard units. The range of doses or series of doses must be

carefully selected in order that the highest value of circulating antitoxin will remain below 5 or 6 standard units. In order to achieve this, dilutions of toxoid were used, and the doses given in a constant volume of 5.0 cc. The antigenic potencies of the toxoids were then determined by the dilutions of the toxoids used, and the values between 1 and 6 standard units to which the circulating antitoxin rose. It has been demonstrated by Farrell and Kitching (2) that dilution affects the antigenicity of a given amount of toxoid, particularly if injections are given intravenously. In view of the fact that in this experiment, injections were given subcutaneously and the estimations were intended to express antigenicity in roughly relative and not accurate absolute units, it is believed that the effect of dilution may be for the most part neglected.

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Influenzal Meningitis—L. N. SILVERTHORNE, *Connaught Laboratories, University of Toronto.*

THE subject matter of this paper is a report on the clinical aspect of influenzal meningitis with special reference to the treatment of 65 infants and children suffering from this disease. In addition bacteriological and serological investigations are presented, including typing of the cultures and virulence experiments. The use of serum and drugs in treatment is discussed.

Influenzal Meningitis: Report of a Case Successfully Treated with Sulphapyridine—G. C. FERGUSON, *Port Arthur, Ont.*, and A. E. ALLIN, *Branch Laboratory, Fort William (Division of Laboratories, Department of Health of Ontario).*

THE patient, J.G., a boy aged 4 years, was admitted to hospital July 23, 1939, with a history of four days' illness. The child was acutely ill, being delirious. The temperature was 105°F., pulse 130. From the cerebrospinal fluid *H. influenzae* was isolated. Anti-meningococcic serum was given intrathecally and intramuscularly, and 0.5 gm. of Dagenan with sodium bicarbonate was administered every four hours. On the following morning the spinal fluid showed relatively few Gram-negative bacilli. *H. influenzae* was again isolated on culture. The patient's temperature was 100°F. Cerebro-spinal puncture was carried out twice daily on July 24th, 25th and 26th and the serum treatment continued July 24th and 25th. The doses of Dagenan were reduced to 2 gm. daily on July 27th, and discontinued on August 2nd. The patient's temperature returned to normal on August 1st and he made an uninterrupted recovery.

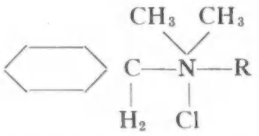
Disinfection with Surface-Active Disinfectants—R. J. SCHNITZER, *Connaught Laboratories, University of Toronto.*

IT is well-known that amongst homologous series such as the alcohols, the amines, and the fatty acids, the surface tension decreases with increasing molecular weight (Traube's rule). This rule is also valid when the increase in

molecular weight is due to the number of CH_2-groups in the side chain. It is also known that with increase in molecular weight and the consequent diminution in surface tension, the bactericidal activity of certain compounds may also increase. This may be due, according to Frobisher and others, to the high surface activity of the compounds, facilitating the absorption of the active agents on the surface of the organisms, and promoting in this way their bactericidal properties. One example of the connection between physical property and bactericidal power is in the group of alkyl resorcinols (Leonard), of which the best known is hexyl resorcinol. Other series of compounds may be mentioned including even substances of so high molecular weight as the homologous series of hydroquinine.

High surface activity does not necessarily mean high bactericidal power. The most powerful surface-active substances, such as the soaps, are in fact of limited antiseptic power. Other compounds, e.g., the amines or the fatty acids on which Traube's rule was founded, have not given preparations of practical antiseptic value.

It has been found, however, in recent investigations that amines of high molecular aliphatic compounds containing 8 to 18 C-atoms (i.e., a mixture of fatty acids of the coco-nut oil) are not only of very high surface activity but are also very powerful disinfectants. These are actually in use in the form of compounds with a quaternary ammonium group, the general formula of which is the following:



(R = mixture of C_8H_{17} to $C_{18}H_{37}$)

In the Rideal-Walker test the phenol coefficient for typhoid bacilli is about 200 to 300 and gram-positive organisms are acted upon equally well. One of these compounds recently studied by Dunn has been found to have a similar activity.

In recent experiments the author has found that surface activity and germicidal power are not due to the presence of the quaternary ammonium group, for they can be demonstrated equally well in the unsubstituted amines with trivalent N. The surface activity of these compounds, e.g., the amines of coconut oil or palm-oil, is so high that they produce a real foam like the soaps, and actually combine cleansing as well as disinfectant properties. These activities are even manifest at a dilution of 1:10,000.

It is, however, of some importance that these compounds have no action on the tubercle bacilli and other acid-fast organisms; only one compound out of 30 to 40 tested has been able to kill this organism.

This compound, it should be noted, had no physical properties other than those of the related but inactive compounds, for which reason its action on the tubercle bacillus cannot be explained on a physical basis.

This shows that, although the physical properties of chemical compounds

might be a valuable help in finding new compounds of high bactericidal efficiency and even in explaining the mechanism of their activity, they are not a reliable guide to their specifically bactericidal activities which are due in every case to the chemical constitution and the affinity between disinfectant and microbes.

Combined Action of Sulphapyridine and Serum in Experimental Staphylococcus Infection in Mice—LEONE N. FARRELL, *Connaught Laboratories, University of Toronto.*

SULPHAPYRIDINE and staphylococcus antitoxin have been found to have a synergic effect in protecting mice against 5 average lethal doses of highly toxigenic staphylococci, a dose which killed untreated mice in 4 to 5 hours. A prophylactic dose (0.5 cc.) of staphylococcus antitoxin alone prolonged the life of 50 per cent. of the mice for about 3 days, although eventually all succumbed with evidence of gross infection of liver, spleen, kidneys, heart and lungs. On the other hand, 75-100 per cent. of mice receiving prophylactic antitoxin and treated (*per os*) with 10 mg. of sulphapyridine twice daily for 5 days survived for 14 days. At 14 days such mice showed abscesses in kidneys, liver and spleen but an almost uniform absence of infection of the lungs. Evidence was obtained, however, that staphylococcus pneumonia was present at least at the end of 3 days, but those mice treated with sulphapyridine were able to overcome this manifestation of infection and survive.

Treatment with sulphapyridine alone, without prophylactic serum, did not modify the lethal effect in any degree, even when administered prior to infection. This failure is attributed to the fact that the action of the sulphapyridine is bacteriostatic rather than bactericidal and the resultant "lag" period before the action becomes manifest (about 6 hours) overlaps the survival time of otherwise unprotected animals when such a rigorous lethal test is used.

Daily treatment for 5 days with small doses (0.1 cc.) of antitoxin, as well as the prophylactic dose of serum, was not found to give more protection than the large initial prophylactic dose alone, while combined treatment with these small doses of antitoxin and sulphapyridine was not significantly different from sulphapyridine alone. Experiments in which treatment is carried out with larger doses of serum and of sulphapyridine are, however, in progress, in order to determine whether it would be advantageous to continue serum therapy once the initial toxaemia is overcome and the sulphapyridine becomes effective, and also in order to determine whether abscess formation may be prevented.

The Microflora of the Rhizosphere in relation to Resistance of Plants to Soil-borne Pathogens—A. G. LOCHHEAD, M. I. TIMONIN, and P. M. WEST, *Division of Bacteriology and Dairy Research, Science Service, Department of Agriculture, Ottawa.*

IT has long been recognized that soil in the vicinity of the roots of growing plants supports, usually, noticeably higher number of micro-organisms than soil more distant from the plants. Studies on a variety of cultivated crop plants have shown that not only are purely quantitative differences manifest between

control soil and rhizosphere (zone of influence of the roots), but the qualitative nature of the soil microflora is markedly influenced by the growing plants. The effects may be noted with respect to both the morphology and physiology of the predominant bacteria, and have been observed with seedlings, and with more mature plants from the field.

In the course of investigations of the rhizosphere of various crop plants, studies were included to compare certain varieties of plants regarded by plant breeders as resistant and susceptible respectively to soil-borne diseases in which definite pathogenic fungi are involved. Varieties of flax resistant and susceptible to wilt, and tobacco varieties resistant and susceptible respectively to black-root rot were compared. Observations were made from investigations of the microflora of the rhizosphere from different methods of approach, viz., quantitative, morphological and physiological. It was noted that the various comparative studies gave results of similar trend, and provided an accumulation of evidence suggestive of inherent differences in the physiology of resistant and susceptible varieties of the same plant, resulting, in the case of the susceptible varieties, of a more pronounced "rhizosphere effect".

Quantitative studies indicated that the susceptible varieties of both flax and tobacco supported in their rhizosphere higher numbers of bacteria and fungi than did corresponding resistant varieties of the same crop plants. Numbers of actinomycetes are relatively unaffected by the growth of plants, and showed no significant differences between the varieties. In the case of bacteria and fungi the differences were observed, not only in samples from the field, but also in the case of seedlings kept under uniform temperature and moisture conditions.

Bacterial Morphology. In a comparison of the relative incidence of different groups of soil bacteria as affected by growth of various crops it was found that a selective action was apparent, characteristic of the rhizosphere of all plants studied, with respect to four morphological groups. In all cases Gram-negative short rods were proportionately stimulated, whereas Gram-positive short rods, coccoid rods and spore-formers were relatively less numerous in the rhizosphere than in soil more distant from the plant.

Comparison of the rhizosphere of resistant and susceptible varieties of flax and tobacco indicated a similar trend with all groups of organisms. Whether the relative incidence is increased or decreased in the rhizosphere of the resistant as compared with the control soil, the effect is more pronounced with the susceptible plants.

Physiological (Nutritive Requirements). In adapting quanti-qualitative methods used above to a comparison of certain physiological aspects of the rhizosphere micro-organisms, a study was made of bacterial nutritive requirements.

Rhizosphere organisms exhibited growth requirements of increased complexity as compared with the indigenous soil forms. However, differences between resistant and susceptible plants were noted with respect to bacteria for which amino-acids were essential or stimulative, and to those reacting to growth factors, of which thiamin and biotin were particularly significant. Similar trends were noted with both flax and tobacco, indicative of a greater "rhizo-

sphere effect" in the case of the susceptible plants, and suggesting that similar fundamental factors were operative.

The findings from studies by various methods of approach support each other in suggesting differences in the physiological function of the roots of plants differing in resistance, with resultant modification of the microflora of the soil.

Routine Diagnosis of Pathogenic Fungi in the Public Health Laboratory —W. B. McCLURE, *Division of Laboratories, Department of Health of Ontario.*

THE importance of diagnosis by laboratory methods of infectious lesions which may be due to pathogenic fungi is stressed. Methods of obtaining and submitting suspected material to the laboratory are described. Laboratory diagnosis, using the potassium hydrate preparation, by culture and micro-culture in the Van Lieghen cell are considered. The various fungi of local importance are reviewed.

The following table gives the incidence of pathogenic fungi in 287 cultures which were made at the Central Laboratory of the Department of Health.

SOURCE	Negative	Yeast-like fungi	M. lanosum	T. purpureum	T. gypseum	E. inguinale	Blastomyces	Aspergillus
Sputa	79	37						
Throat swabs	6	1						
Vaginal swabs	12	2						
Urine	2							
Scalp	16		3		1			
Skin	43	1	1	1		1		
Foot	9	1		1	1			
Hand	13							
Ear	1	1						1
Nails	5	1		2	2			1
Pus	9	1					2	
Beard	2							
Doghair			2					
Unknown	24	1			1			
	221	46	6	4	5	1	2	2

A Survey of Intestinal Parasites in Children in Toronto—E. KUITUNEN-EKBAUM, *Connaught Laboratories, University of Toronto.*

THE survey was carried out during the winter of 1938-39 in the Hospital for Sick Children in Toronto, the Thistletown Branch of the same hospital, and the I.O.D.E. Preventorium. The ages of the children examined varied from 1 to 15 years.

Faecal samples from 438 children were examined and 147, or 34 per cent., were found to harbour various species of protozoan or helminth parasites. These included *Blastocystis hominis* (47 cases), *Chilomastix mesnili* (9 cases), *Giardia lamblia* (41 cases), *Trichomonas hominis* (3 cases), *Entamoeba histolytica* (3 cases), *Entamoeba coli* (55 cases), *Dientamoeba fragilis* (2 cases), *Endolimax nana* (15 cases), *Iodamoeba bütschlii* (3 cases), *Diphyllobothrium latum* (1 case), *Taenia* sp. (1 case), *Ascaris lumbricoides* (5 cases), *Trichocephalus trichiurus* (1 case), *Enterobius vermicularis* (16 cases).

It is well known that only a small percentage of pinworm infections can be detected by the examination of faecal smears. A more reliable method is the swabbing method.

Perianal swabs were taken from 843 children and 410, or 49 per cent., were found to harbour the pinworm, *Enterobius vermicularis*. In the Hospital for Sick Children the average percentage of enterobiasis was 48, in the Thistletown Branch 32 per cent., and in the Preventorium 73 per cent. The reasons for the difference in the incidence of enterobiasis among the children in the Thistletown Hospital and the Preventorium are not at present known. The hygienic conditions in both institutions are apparently perfect. Further investigations may possibly reveal reasons for the higher rate in the one.

Some Notes on Schistosome Dermatitis—S. HADWEN and A. MURRAY FALLIS, *Ontario Research Foundation, Toronto.*

THE cause of "swimmers' itch" in certain lakes in Elk Island Park, Alberta, was investigated during the summer of 1939. Cercariae of the *"elvae"* group were thought responsible for the outbreak, as they were found in snails *Lymnaea stagnalis* present in the lake. These brevifurcate, apharyngeal cercariae, should not be confused with the longifurcate, pharyngeal species.

Active Immunization by the Intranasal Route: A Comparison of Various H. pertussis Antigens—RUTH P. DOW, *Department of Bacteriology and Immunity, McGill University, Montreal.*

VARIOUS *H. pertussis* antigens have been compared by the method of actively immunizing mice by the intranasal route. Three doses of each antigen were given at five-day intervals to batches of mice under ether-chloroform anaesthesia. One week after the last dose, the mice were inoculated with 3 m.l.d. of living *H. pertussis*. The antigens tested were: the soluble antigens of Parke Davis, Mulford, Lederle and Glaxo, and the whole *H. pertussis* vaccines of Sauer, Ansley, Silverthorne and R.P.D. The results were as follows:

	Immunized	*Survived*	*Per cent.*
H. pertussis vaccines	127	106	83
Lederle	31	13	42
Parke Davis	35	15	43
Mulford	37	14	38
Glaxo	47	8	17

It is, therefore, justifiable to conclude from these findings that whole vaccines are more effective immunizing agents than are the soluble antigens. No difference in antigenic value could be demonstrated by this means between the whole vaccines used, namely, Sauer, Ansley, Silverthorne and R.P.D.

Agglutinins appear in the blood stream of mice immunized by the intranasal route.

Rabbits can be immunized with living cultures of *H. pertussis* intranasally under ether-chloroform anaesthesia. Agglutinins appear in the blood stream to a titre of 1: 16,000; this titre is lower than can be reached in rabbits by means of the intravenous route, but the protective power of the serum is as good.

Active immunization in humans by this route has been attempted. The administration is easy and no reactions appear.

Preliminary Report on Some Cases of Pasteurella Infection of the Respiratory Tract—D. H. STARKEY and J. F. MEAKINS, *Department of Bacteriology and Immunity, McGill University, Montreal.*

THE report consists of the following divisions: A review of the numbers and types of cases found in the literature. A report of ten cases, all representing infections of the respiratory tract. A description of the types of organisms isolated in this series of cases. Reasons for considering that the Pasteurella were the aetiological agents in these cases.

The Isolation and Identification of the Virus of Equine Encephalomyelitis—F. W. SCHOFIELD, *Ontario Veterinary College, Guelph.*

THE isolation of the virus of encephalomyelitis can be achieved by taking a sample of the blood from either an infected horse or guinea-pig during the febrile period, and inoculating it directly either into the brain of a guinea-pig or on the chorio-allantoic membrane of an 8- to 10-day-old chick embryo. In the guinea-pig, increase in temperature appears in from 24 to 48 hours, and death from paralysis occurs in from three to five days. Death of the embryo occurs in from 24 to 36 hours, with the development of a typical haemorrhagic reaction. This method gives the most rapid results.

The brain of the paralysed guinea-pig or the membrane of the infected embryo is ground and suspended in saline and neutralization tests with both Eastern and Western immune sera are then carried out. The virus-antiserum mixtures are incubated and then inoculated intracerebrally into guinea-pigs.

This method permits isolation and identification of the strain of encephalomyelitis within a few days.

The virus remains alive in 0.25 per cent. sodium citrate, or in blood serum, for at least three days. The "Eastern" type of virus was used in these experiments.

Fluctuations in the Titre of Neutralizing Antibody for Influenza Virus in Human Beings—RONALD HARE, *Connaught Laboratories and School of Hygiene, University of Toronto.*

THE changes which occur in the immunity of adults for influenza virus over a period of two and one half years have been studied by means of the serum-virus neutralization test. During this period the individuals passed through two epidemics in both of which virus was isolated.

In persons who became infected, the neutralizing titre of the serum rose during the acute phase but tended to fall during the inter-epidemic period. In those who were infected at the time of the first epidemic, no evidence was obtained of a secondary response due to subclinical immunization at the time of the second epidemic.

There was no suggestion that the titre of the serum was any indication of susceptibility or immunity to infection. Some with a high titre became infected. Others with a low titre escaped infection in both epidemics. There was a possibility that subclinical immunization of contacts might occur during an epidemic but it was by no means marked.

In the adult subjects, the titre for swine virus was always higher than that for human virus and fluctuated in much the same way. In a group of children aged 1-2 years there were some with antibodies for human virus but not for swine virus. In another group aged 10-11 antibody for swine virus was, however, present but lower in titre than for human virus. It is therefore possible that antibody for swine virus in the serum of adults is due to successive stimulations with human virus during the first two decades of life.

The Laughlen Test for Blood Donors—P. H. GREEY, *Department of Bacteriology, Toronto General Hospital.*

BOTH Laughlen and Kahn reactions were done on 2200 prospective blood donors. Of these, 15 were sero-positive by the Laughlen test, but only 8 of the 15 gave positive results with the Kahn and Wassermann reactions. The serum must be inactivated by heat prior to use, since a preliminary study showed that 10 per cent. of positive sera were falsely negative by the Laughlen test when unheated serum was used. The Laughlen test was found to be a rapid reliable method for the exclusion of syphilis in blood donors, but for diagnostic purposes positive reactions should always be checked by methods possessing greater specificity.

The Laughlen Test for Blood Donors—W. L. DONOHUE, *Hospital for Sick Children, Toronto.*

A COMPARISON is made of the Wassermann test and the Laughlen test in the serological diagnosis of syphilis in prospective donors, at the Hospital for Sick Children for the period from September 1935 to December 1939.

A total of 4,273 donors was tested. There were 97 which gave a positive reaction with one or both tests. Of these, 62 were in agreement. Of the remaining 35 donors in which the tests were not in agreement, there were 23 in which the Laughlen test was negative and the Wassermann positive. These are the most important from the standpoint of eliminating syphilitic donors if the Wassermann test is accepted as a reasonable standard. These 23 cases are discussed in some detail as to the probable reason for the discrepancy. It would seem that in a certain proportion of the cases with a positive Wassermann, the Laughlen test is negative on the fresh, inactivated serum, this same serum becoming positive after standing 24-72 hours.

The Relationship of Whooping Cough to Bronchiectasis—I. H. ERB, *Hospital for Sick Children, Toronto.*

THIS report deals with the study of the clinical and autopsy records of 28 cases in which death resulted from respiratory disease associated with or following whooping cough. All were infants or very young children, the oldest child being only 3 years of age while no less than 24 were under 2 years of age. This fact, in itself, illustrates in a striking manner the heavy toll taken by respiratory diseases complicating whooping cough in infants and young children. Furthermore, the changes seen in these lungs at autopsy help to explain the frequency with which bronchiectasis follows whooping cough, a fact which in recent years is becoming generally recognized by most paediatricians.

While the 28 cases showed varying degrees of bronchitis and pneumonia, the important changes from the standpoint of the subsequent development of bronchiectasis are, in the opinion of the author, the cellular infiltration of the bronchial wall, the plugging of the lumen with tenacious exudate causing obstruction, the resulting ulceration of the epithelium with destruction of elastic and muscle fibres and in some cases excavation of the surrounding lung parenchyma. In the cases that survive for several months, can be seen nature's attempt to repair the damage by the development first of naked granulation tissue in the wall of the dilated bronchi and the re-lining of this granulation tissue with new epithelium which may or may not be of a modified type.

Because of the difficulty of differentiating clinically between acute bronchitis and bronchopneumonia in early infancy, no attempt is made to estimate the duration of the pneumonia in relation to the total duration of illness from the onset of whooping cough. It would appear, however, that those patients who died relatively early in the course of their illness show little tendency to bronchial ulceration. Thus, of the 12 cases in which no ulceration was demonstrated, the duration of illness was less than 1 month in 11 cases. On the other hand, in the

16 cases showing ulceration, whether mild or severe, the total duration of illness was over 1 month in 13 cases and of these 13, it was over 2 months in 7 cases. It is in these more chronic cases that the stages in the development of bronchiectasis are best studied. In the presentation of the paper an attempt is made by the use of lantern slides to trace these various stages in the progress of the disease.

The report includes, also, an example of what may be termed the end stage of this condition. This is the case of a girl who developed bronchiectasis following an attack of whooping cough at 2 years of age. Five and a half years later the bronchiectatic lobe was successfully surgically removed. This specimen exemplifies the permanent and extensive damage to both lung and bronchi so characteristic of this disease.

By calling attention to the fatal respiratory complications of whooping cough and the disabling effects of bronchiectasis in many of the recovered cases, this report emphasizes the importance of employing any prophylactic measures which may be available in combating this scourge of infancy and early childhood.

Statistical Survey of Ten Years' Diagnostic Pathological Service—S. F. PENNY and H. D. HOWELL, *Division of Laboratories, Section of Pathology, Department of Health of Ontario.*

THIS paper presents the findings of a survey of 42,008 pathological tissues. of which 11,026 or 26.2 per cent. were tumours, the remainder consisting of inflammations, degenerations, metaplasias, hyperplasias, and congenital defects. Of the 11,026 tumours diagnosed, 6,548 or 59.3 per cent. represented benign lesions and 4,478 or 40.7 per cent. were classed as malignant. The malignant tumours represented 10.6 per cent. of all specimens submitted.

As the total number of specimens increased each year, the total cancerous specimens also increased, but the ratio of cancerous to non-cancerous tissues declined. This appears to be due to a more widespread appreciation by the medical profession and the laity, of the value of pathological examination of all surgical tissues.

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PUBLIC HEALTH IN WARTIME

WE in Canada are engaged in a war the ultimate scope and cost of which cannot even be conjectured. The demand has already gone out for curtailment of public expenditures and redirection of effort. All things not directly related to the successful conduct of the war must be subservient to those that are. Health expenditures are likely to be considered as subject to curtailment by those who control the public purse. That such reduction in the support of both official and voluntary agencies did occur during the last war is a matter of history. As Dr. Alan Brown, Physician-in-chief of the Hospital for Sick Children, Toronto, pointed out in a recent address, voluntary agencies not directly concerned in the war effort were deprived both of workers and of financial support. Summarizing the situation, Dr. Brown stated: "Some private agencies discontinued their work, all of them curtailed their activities, and the governmental departments became less efficient. As a result, sickness and death among infants and children increased by leaps and bounds."

In the important survey of the extent and adequacy of the public health organization and the provision of medical care in Canada, the findings of which have just been published by the Canadian National Committee for Mental Hygiene, there is ample evidence that public health organization in Canada must be strengthened and there must be a more adequate distribution of medical, dental, and nursing services. In a recent report presented to the Dominion Council of Health by a subcommittee of that body, the startling fact was shown that, of the total expenditures for public health in 1937 by all provincial governments, which amounted to $21,719,000, $18,111,000 was expended for the maintenance of public and mental hospitals and tuberculosis sanatoria. Only approximately $3,000,000 was available for the other work of the nine provincial departments of health. Although the expenditures for public health have been considerably increased in several of the provinces, the amount of money appropriated for preventive services is but a small fraction of the total amount expended for the care of sick persons whose maintenance in institutions becomes a charge upon the government. There can be no reduction in the essential expenditures for public health by the federal or provincial governments or by municipalities without immediate

curtailment of the services rendered and an ultimate cost that cannot be calculated.

The two decades since the last war have shown great advances in public health. Tuberculosis is being controlled. Progress is being made in the control of cancer. Typhoid fever is no longer a disease that threatens the health of municipalities. Tremendous advances have been made in the control of diphtheria. There has been a marked reduction in the number of deaths from diarrhoea and enteritis in children in communities where pasteurization of milk is practised and a safe water is supplied. Reference is made elsewhere in this issue to the gratifying improvement in the maternal mortality rate. There have been reductions in the incidence and in the mortality of many other diseases. In every province progress is being made in the treatment of mental disease, and if more adequate funds were available greatly extended programs of mental hygiene would be possible. Public health is not concerned only with the question of disease. There is a new emphasis today on the importance of nutrition. The National Housing Act is evidence of the desire of the federal government to aid the provinces in better housing. In many municipalities local efforts have been successful in the rehabilitation of property so that housing conditions have been bettered.

These gains must be consolidated. The last war left its lessons. There can be no reduction in public expenditures, and no lessening of public effort, for the safeguarding of health. There must be a revaluation of services now in operation and new economies must be effected. Extra effort may be demanded of those who are now giving what appears to be a maximum service. Objectives must be clearly defined, but once this has been done there should be no assent to the curtailment of such essential work. It is the duty of the medical officer of health to take stock of the health program of his community. It is his duty, now more imperative than ever, to make the needs known to the public and to obtain support for a sound program. Let us continue during the coming months to strive to give constructive leadership in all matters pertaining to the public health; to consolidate those things already won; and to view the problems of the war and its anticipated aftermath with the same clarity of vision and hopeful confidence that have carried us through the vicissitudes of the past.

VITAL STATISTICS

THE RECENT IMPROVEMENT IN MATERNAL MORTALITY IN CANADA

A REDUCTION in maternal mortality of sufficient extent to demand the interest and enquiry of Canadian health workers is indicated by preliminary statistics for Canada, 1938.* After a quarter of a century during which the recorded maternal death rate showed no consistent evidence of decline in the nation as a whole, the recent development is the more striking. It is true that the western provinces had shown some improvement in recent years, but in the rest of Canada and in Ontario and Quebec in particular, the risk of death from pregnancy and childbearing failed to respond to what measures were being applied.

In table I are given the maternal death rates for five divisions of Canada, expressed in the conventional form—deaths per 1,000 live births.

For Canada as a whole the maternal death rate for 1938 (preliminary) was 4.2 per 1,000 live births compared with 4.9 in 1937 and 5.6 in 1936. This rate is the lowest figure since the establishment of national vital statistics in 1920. The decline recorded is due entirely to reduction in mortality in the area from Ontario to the Pacific coast. In these areas as a whole the rate was below 4 per 1,000 live births for the first time. In Manitoba and Saskatchewan the rates were 2.5 and

TABLE I

MATERNAL MORTALITY BY PROVINCES—1921 TO 1938
(Rates per 1,000 live births)

Year	Maritime Provinces	Quebec	Ontario	Prairie Provinces	British Columbia	Canada†
1921	4.1	—	5.2	5.6	4.8	5.1
1922	5.2	—	5.2	6.0	6.2	5.5
1923	5.7	—	5.3	5.3	6.3	5.4
1924	5.6	—	5.8	6.2	6.8	6.0
1925	5.3	—	5.5	5.9	5.8	5.6
1926	5.5	—	5.6	6.4	6.5	5.9
1927	6.2	4.9	6.0	5.6	6.7	5.6
1928	5.5	5.3	5.8	5.9	5.9	5.6
1929	5.9	5.3	5.4	6.7	5.6	5.7
1930	5.8	5.5	6.2	5.6	5.8	5.8
1931	5.3	4.8	5.4	4.7	6.3	5.1
1932	5.3	5.1	5.1	4.5	5.3	5.0
1933	5.2	5.0	5.4	4.4	4.7	5.0
1934	5.7	5.5	5.6	4.4	5.1	5.3
1935	4.9	5.4	5.0	4.2	5.2	4.9
1936	5.4	6.0	5.7	5.2	4.7	5.6
1937	3.4	5.2	5.2	4.6	4.5	4.9
1938‡	4.2	5.2	3.8	3.2	3.9	4.2

†Registration area.
‡Preliminary figures.

*Preliminary Annual Report, Vital Statistics of Canada 1938. Dominion Bureau of Statistics, Ottawa, 1939.

TABLE II

MATERNAL DEATHS BY CAUSE
ONTARIO 1933-38

Cause of Death	1933-1938			1938		
	Deaths		Rate†	Deaths		Rate†
	No.	%		No.	%	
Abortion with sepsis	199	11.8	0.64	26	10.4	0.40
Abortion without sepsis specified	58	3.5	0.19	9	3.6	0.14
Ectopic gestation	63	3.7	0.20	11	4.4	0.17
Puerperal haemorrhage	191	11.4	0.61	22	8.8	0.34
Puerperal septicaemia	348	20.7	1.10	50	19.9	0.76
Puerperal albuminuria and eclampsia	317	18.9	1.01	45	17.9	0.69
Other toxaemias of pregnancy	89	5.3	0.28	9	3.6	0.14
Puerperal embolism, sudden death	180	10.7	0.57	41	16.3	0.63
Other accidents of childbirth	195	11.6	0.62	35	13.9	0.53
Other conditions*	41	2.5	0.13	3	1.2	0.05
Total	1,681	100.0	5.37	251	100.0	3.83

*Including Other Accidents of Pregnancy and Other Puerperal Conditions.
†Rate per 1,000 live births.

2.9 respectively, the former being less than half of that in Quebec. These figures are indeed striking.

What causes are chiefly responsible for the observed decline in the maternal death rate? Data on this point for Ontario are given in table II for the year 1938 and for the five-year period preceding.

Contributions to the total reduction have been made by all causes except puerperal embolism. Most marked decreases are observed in abortion—35 per cent., puerperal haemorrhage—44 per cent., puerperal sepsis (excluding abortion)—31 per cent. and puerperal toxaemia—36 per cent. The spread of the improvement over almost the entire list of puerperal causes suggests that some general influence rather than any specific agent is responsible. The possibility of a change in the practice of classifying puerperal causes having played a part may be disregarded. No changes were undertaken during the period.

In Manitoba the death rates from abortion and puerperal haemorrhage were greater than in Ontario during 1938. Puerperal sepsis, toxaemias and embolism, however, were much less frequent, proportionately. Only 10 per cent. of the deaths were due to each of puerperal sepsis and puerperal eclampsia—a remarkable record even for one year.

TABLE III

MATERNAL DEATHS BY AGE
ONTARIO 1933-1938

Age	1933-1937			1938		
	Deaths		Rate*	Deaths		Rate*
	No.	%		No.	%	
Under 20	90	5.4	3.63	18	7.2	3.47
20–29	695	41.3	4.03	108	43.0	3.00
30–39	725	43.1	7.23	100	39.8	4.77
40+	171	10.2	11.44	25	10.0	7.99
Total	1,681	100.0	5.37	251	100.0	3.83

*Rate per 1,000 live births.

The changes in maternal risk by age of mother cannot be accurately stated without analyses which adjust the data for variation in the proportion of the various orders of pregnancy in successive age groups. Crude data alone on maternal mortality by age are given in table III.

There was no change in the distribution of live births by age of mother during 1938 compared with the preceding five-year period, but the proportion of deaths in the age groups under 30 years increased and in the group 30-39 years, declined. This indicates that special improvement in maternal mortality was achieved in the older age groups. The actual changes are indicated by the rate columns in table III where the greater reduction in maternal risk is noted. The reductions in mortality by age expressed as percentages of the average rate for the five years 1933-1937 are: Under 20 years—4 per cent., 20-29—25 per cent., 30-39—34 per cent. and ages 40 and over—30 per cent.

Along with the improvement in maternal mortality during 1938, the infant death rate reached the lowest level in national history at 63 per 1,000 live births. The provincial rates in all provinces declined markedly over the previous year and in six instances the rate for 1938 was the lowest yet recorded. Reduction in the neonatal mortality rate was also experienced although the change was not as pronounced. No material change occurred in the recorded stillbirth rate during the year.

The reduction in maternal mortality is worthy of note in view of evidence presented during the past three years identifying unnecessarily high puerperal mortality, among other things with faulty nutrition and inadequate medical care. English studies previously commented on in this Journal, e.g. the Rochdale experiment, the experience of the Willesden Maternity Hospital and researches into malnutrition as a cause of maternal mortality in the Rhondda urban district (Canad. Pub. Health J., 1938; 126, and 1937; 566), all have tended to refresh our outlook on this problem. Methods of attack adopted, indeed, have become so stereotyped in recent years and the deluge of detailed enquiries so similar in their analytical content that such new approaches may well give fresh impetus to the efforts being made.

What is the explanation of the observed decline? We have no reason to feel assured that the momentarily brighter picture will continue, but it behooves those whose particular job lies in this field to enquire into the observed facts further. We have learned quite recently of significant reductions in maternal mortality in England, reductions apparently believed to be associated with concrete efforts in that country. In Canada, no special change occurred during 1937-38, either in policy or practice which would appear to account for the recent development described. No new program can appear to claim the honour of this contribution. The undertaking of a study of all pregnancies and deliveries in Manitoba over a two year period beginning in 1938, a newer approach to the problems of puerperal septicaemia, and a tendency to stress the nature of medical care received as the one vital factor—all these and others are open for consideration as contributing to the recorded improvement. If this improvement is to be maintained, and not sporadic, however, it is desirable that some light be thrown if possible on the most probable answer to our question: What is the explanation of the observed decline?—*A. Hardisty Sellers, M.D., D.P.H., Medical Statistician, Ontario Department of Health, Toronto.*

THE FIFTH DECENNIAL REVISION OF THE INTERNATIONAL LIST OF CAUSES OF DEATH

THE details of the fifth decennial revision of the International List of Causes of Death completed in Paris in September, 1938, are now available. Unsettled conditions were responsible for the absence of delegates from many countries and only eighteen nations were represented. Outweighing this disadvantage, however, was the remarkable unanimity of the Conference—every revision being accomplished unanimously and without requiring a vote to be taken.

This revision of the List is of particular interest to Canadians because it was the first at which the Dominion Bureau of Statistics was officially represented. Canada, of course, has had a unique interest in developments from the beginning since it was at the Ottawa meeting of the American Public Health Association in 1898 that a resolution recommending decennial revision of the List adopted by the International Institute of Statistics in 1893, was endorsed. In this revision, too, Canada had a very intimate interest since a committee of the Association materially assisted the Dominion Bureau of Statistics in preparing the Canadian brief of suggestions for the Conference.

As heretofore, three lists of causes—detailed, intermediate and abridged—were prepared by the Conference. In addition, a revised list of causes of stillbirth was drafted. In undertaking the revisions, the Conference recognized the importance of limiting, as far as possible, any changes in the detailed List which might create disturbance in the numbering of the various titles. The detailed list is therefore retained in its original form with 18 classes and the same number of rubrics (200). Improvements indicated by experience and scientific developments were made with a view to avoiding any change in the content, number and even the actual numbering of the various titles within major groups.

Among the highlights in the new List are the following. The changes made in class I, Infectious and Parasitic Diseases, are especially noteworthy. These are now subdivided under the various headings, grouping together, respectively, diseases due to bacteria, protozoa, spirochaetes, filterable viruses, rickettsia, helminths, fungi and other infective or parasitic diseases. This modification will be of value in facilitating the preparation of data under the various heads.

Changes involving transfers from one class to another in the List are infrequently made. An important change of this sort, however, is to be seen in the new rubric for syphilis (30). In keeping with practical needs the new title has been made inclusive by the transfer of locomotor ataxia (tabes dorsalis) and general paralysis of the insane, from diseases of the nervous system, and aneurysm of the aorta from diseases of the circulatory system. It is recognized, of course, that mortality statistics in syphilis are prone to be understated, but this change will at least draw attention to the total *recorded* mortality from this cause.

An improvement has been made in class II, Cancer and Other Tumours, by the designation of a separate rubric for cancer of the urinary organs (both sexes) and provision of a separate rubric for cancer of the male genital organs. A separate rubric is also provided for cancer of the brain and nervous system.

In the light of renewed interest in heart disease, particularly at younger ages, and the entire absence of reliable data on rheumatic fever as a factor in such mortality, perhaps the most significant provision in the new detailed List is the setting up of optional sub-titles in the cardiac group (Rubrics 90, 92, 93 and 95). Those countries which adopt such sub-titles will be able to designate, in so far as medical statements indicate, those deaths which in the opinion of the

physician, are due to heart disease of rheumatic origin. This new provision is of great importance and is in line with the recommendations made by the Association's Committee on the subject.

Changes introduced in class XI, Diseases of Pregnancy and Childbirth and the Puerperium State, will make possible a more accurate picture of maternal mortality on the basis of time of death in relation to labor. Separate rubrics are provided for haemorrhage, toxaemia and other diseases or accidents of pregnancy occurring before labour and delivery, apart from abortion. These changes were made largely on the suggestion of the British and American representatives at the Conference. Under the title Infections during Childbirth or the Puerperium are included puerperal thrombophlebitis as well as embolism and sudden death (old rubric 148). Proper use of this revised scheme will be contingent upon the securing of necessary supplementary data re the time of death in relation to delivery.

In class XVII, Violent and Accidental Deaths, expansion of the section dealing with accidents was effected by reducing the number of rubrics devoted to suicide. The numbers thus made available have been used for accidents in transportation, accidents in mines and quarries, accidents due to machinery, etc. The new rubrics 169 to 195 are now devoted to accidental deaths, numbers 169 to 176 including deaths under specified circumstances regardless of the cause of death, while 177 to 195 exclude deaths which by convention are to be classed to the previously mentioned rubrics. It is of interest that the revised list contains suggested provision for more adequate treatment of deaths among civilians or the Forces due to war. This is accomplished by the insertion of two rubrics: 196—Deaths of Persons in Military Service During Operation of War, and 197—Deaths of Civilians due to Operation of War. Optional subtitles under each separate deaths from poison, gas, wounds and other causes.

The Conference again prepared a draft list of the causes of stillbirth, abandoning at this time the former basis, namely—time of death in relation to labor and delivery. The suggested classification is divided into four groups—stillbirth caused by diseases in or accident to the mother; anomalies of the foetus, placenta or cord; death of the foetus by injury or other causes (not elsewhere specified).

The intermediate and abridged lists prepared by the Conference contain 87 and 44 rubrics respectively and the introduction of tabulation according to the new classification is recommended as from January 1, 1940.

Special consideration was given by the Conference to the problem of joint cause selection, particularly in its relation to international comparability. It will be recalled that the United States Government at the 1929 Conference undertook studies of means whereby the various methods of selection in effect throughout the world might be unified. In August 1938 a special report was published by the Bureau of the Census at Washington, presenting the findings based on a sample of 1,032 deaths. This study was sufficient to indicate the need for recognizing the limitations in any international comparisons and to justify further study. The Conference went on record acknowledging the work of the United States Government in this connection, urging the continuance of investigations over the next ten years in co-operation with other countries and organizations.

The Conference again went on record urging the desirability that medical students and medical practitioners be given instruction in the principles according to which medical certificates of cause of death should be completed. In this connection Canada has already taken a leading part, such instruction already being provided for in all Canadian medical schools.—*A. Hardisty Sellers, M.D., D.P.H., Medical Statistician, Ontario Department of Health, Toronto.*

PLANS, PROGRAMS, AND PROGRESS

A Survey of Nutrition in the Public Schools of the Lamont Health District, Lamont, Alberta

WHEN active services were commenced in this health district in September, 1938, our work was at first confined largely to school children. Early in the course of inspections and examinations of the children it was realized that a large number were underweight or ill-nourished, and it was decided to learn more concerning the diet of the average school child of the District. With this in mind, the school teachers were asked to help the pupils prepare a food diary for two weeks, January 16-31, 1939, showing the various items of food each child had at each meal during this period. Although it would have been desirable to know the amounts of the various foods consumed, any attempt to obtain this information was deemed futile.

No doubt the teachers of the District were aware of the need for some such investigation, for their response was most heartening. They promptly submitted diaries of 3,433 children. The checking of this material was a protracted undertaking, but the results yielded some significant information. One conclusion reached was that too little canning of fruits, vegetables, and meats is done in some rural areas. The variety of vegetables listed in the diaries is restricted and consists very largely of potatoes and cabbage; the meat is predominantly pork, and very little fish is eaten. Where there is a shortage of milk, not enough cheese is consumed to replace it. The following table indicates briefly our most obvious findings. Of 3,433 children,

3,108 children were not taking cod liver oil.
3,195 children had no liver in their diet.
1,200 children had no eggs in their diet.
1,039 children had no fish in their diet.
1,399 children had no cheese in their diet.
111 children had vegetables only 1 to 5 days.
1,543 children had eggs only 1 to 5 days.
2,125 children had fish only 1 to 5 days.
980 children had butter only 1 to 5 days.
409 children had meat only 1 to 5 days.
310 children had milk only 1 to 5 days.
1,188 children had fruit only 1 to 5 days.
1,652 children had cheese only 1 to 5 days.

An examination of our records reveals that of 3,060 school children inspected, 1,812 were underweight according to standard tables prepared by Dr. Thomas D. Wood. Of these 1,812 pupils, 456 were more than 10 per cent. underweight. Of a group of 586 children, 42 were found to have various degrees of swelling of the thyroid gland.

In April, 1939, haemoglobin determinations (Talquist method) were made on 381 rural school children. The tests indicated that only 35 per cent. of the children tested had haemoglobin readings within normal limits.

Rickets is a condition not uncommon in the rural areas and vitamin D therapy has had to be instituted in a number of cases. An attempt is being made to induce the local school boards to undertake the daily administration of cod liver oil to school children. At present several schools, with 443 children, have consented to undertake the administration of cod liver oil at their own cost for a period of five months during the coming winter. The school boards have agreed also to encourage the serving of hot noonday lunches during the winter time.

A number of scales are being purchased which will enable the teachers to prepare monthly records of the weights of their pupils and to submit them to the Health District offices. In this way a closer record of the progress of the individual child will be kept. It will enable the health officer to select those pupils who merit special attention and to investigate their condition as required.

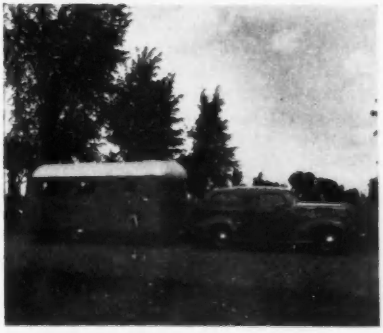
Realizing the need for instruction in dietetics in many areas, the Health District made arrangements with Miss Cameron of the Dominion Department of Agriculture to spend some time with us last fall conducting talks and con-

ferences on nutrition in the hamlets and villages of the District. Through the kindness and cooperation of the Lamont Public Hospital it has been possible to make similar arrangements with the hospital dietitian, Miss Lipsey, to spare us two weeks of her time to conduct demonstrations in cooking and canning and to give talks on nutrition in the more outlying parts of the District. We believe that this work of Miss Cameron and Miss Lipsey will be of great benefit.

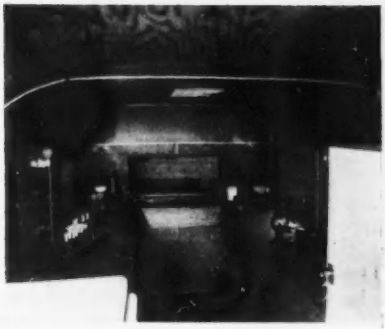
The staff of the Health District itself is making every effort, through moving pictures, newspaper articles and talks, to convey to the public available information on nutrition.—*H. Siemens, M.D., Medical Officer of Health, Lamont Full-Time Health District.*

MOBILE LABORATORY OF THE LABORATORY OF HYGIENE

DURING the past summer the Department of Pensions and National Health designed and had constructed a travelling laboratory which will be employed in various phases of sanitary engineering and epidemiological work in which the Department is engaged. The mobile laboratory, established, maintained, and staffed by bacteriologists of the Department's Laboratory of Hygiene (Bacteriological Branch) enables



its health authorities to act quickly and efficiently in areas where bacteriological investigation is desired. Last year, to ensure the maintenance of sanitary conditions in shell-fish areas, the Department, in co-operation with the Department of Fisheries, sent the unit into the Maritime provinces where it provided field service around the Northumberland Straits, in Nova



Scotia and New Brunswick.

The laboratory consists of a truck and a trailer, the latter designed to serve as a completely equipped laboratory. The truck, a standard sedan light delivery type, with a weight (light) of 2900 pounds, is used for haulage purposes and as a service unit for the trailer when operating in the field. The trailer, which was made according to the specifications of the Department of Pensions and National Health, has a light weight of 3800 pounds and a gross weight of 6000 pounds. Sleeping accommodation is not provided, the trailer being given over to bacteriological equipment and laboratory apparatus which has been so arranged as to afford adequate working room in the 22-foot conveyance. The staff of the laboratory consists of a bacteriologist and one or two assistants, depending upon the nature of the investigation to be carried out.

The equipment of the laboratory consists of an electrically operated incubator, refrigerator, gasoline operated autoclave, Bunsen burners and stove, a microscope and other essential bacteriological equipment. The unit is also provided with its own 12-volt electric power supply and has two 40-gallon water storage tanks. The truck

has an 80-gallon water tank which serves to replenish the water supply in the laboratory.

It is expected that the unit will prove of great value not only to the federal health authorities but also to provincial health departments, with whom the Department of Pensions and National Health co-operates in all matters affecting the public health.

CANCER CASE SURVEY IN MIDDLESEX COUNTY, ONTARIO

THE first effort in Ontario to learn something about the incidence and prevalence of cancer is being launched this month in the County of Middlesex. The plan involves the use of a special schedule on which are to be recorded by each physician and hospital certain details regarding every patient seen, treated or followed-up for cancer or probable cancer at any time during the calendar year 1939. The facts provided for on the schedule include—residence, sex, age, date first seen with cancer, the site of disease, the date last treated for cancer, date last seen, condition when last seen, microscopic diagnosis and type of cancer.

The survey is a joint undertaking by the Department of Health of Ontario and the Cancer Committee of the Ontario Medical Association. Middlesex County was selected because it provided an ideal area in which to begin an enquiry which might later be extended to be province-wide. The incidence of cancer (known or diagnosed cases) determined from any survey depends to a degree upon the effectiveness of treatment measures in the area and upon the stage at which the disease is recognized. Hence such a survey can only be advantageously done in areas with hospital, medical and specific therapeutic facilities of the first order which are readily accessible to all persons. Middlesex too is a satisfactory demographic unit, being a university centre containing a large urban municipality and with fairly central hospital facilities.

Much valuable information is anticipated from the survey. While it cannot be expected to answer many questions which arise concerning treatment, yet it will reveal, for the area concerned at least, the total number of diagnosed cases, the sites affected, the stage of disease when recognized and the ages and sex of cases reported. It will undoubtedly serve as an important beginning in further enquiries into the frequency of cancer among the population.

FORMATION OF SANITARY DISTRICTS IN MONTREAL

DR. AD. GROULX, director of the Department of Health of Montreal, has outlined a plan for the creation of sanitary districts in the city. Each of the districts will have a health centre with offices for the chief district officer and his staff, and accommodation for baby, prenatal, dental, and mental clinics. The first health district will include Prefontaine, Hochelaga, Maisonneuve, and Mercier wards. Dr. J. A. Landreville, who has been a member of the Department of Health as inspector of the child health division for the past eleven years, will be in charge of this district.

NEW CANCER CENTRE IN REGINA

ON November 15th Premier Patterson formally opened the new wing of the Grey Nuns Hospital in Regina, which has been built at a cost of $150,000 to furnish accommodation for the cancer clinic. The second storey of the hospital was furnished jointly by the Government and the Grey Nuns Hospital. The new accommodation is devoted entirely to the diagnosis and treatment of cancer. This is the first building to be erected in Canada designed and equipped for this purpose only. The work has been made possible through the leadership of the Hon. J. M. Uhrich, Minister of Public Health and the members of the Saskatchewan Cancer Commission, of which Dr. R. O. Davison, Deputy Minister of Public Health, is the chairman.

PUBLIC HEALTH NURSING

The Sixty-eighth Annual Meeting of the American Public Health Association

THE sixty-eighth annual meeting of the American Public Health Association, held in Pittsburgh from October 17th to 20th, brought together approximately twenty-five hundred public health workers, among them many of the foremost leaders in the various branches of public health work. These workers came together to share experiences, to discuss trends and developments in public health work, and to plan for the future. The general theme of the conference was "public health for three-thirds of the nation". Much emphasis was put on the importance of knowing the community needs, the training of personnel to meet these needs, and coordinating programs and obtaining the co-operation of workers in order that the best results might be obtained. The week was an intensive refresher course in the whole field of public health, in which nursing plays such an important part, and the programs of the various sections were so interesting that it was often difficult to decide which one to attend.

The meetings of the Public Health Nursing Section were well attended and pertinent subjects were discussed. At a dinner meeting Miss Katharine Tucker discussed some vital questions in regard to preparation for public health nursing (this paper was published in the November issue of Public Health Nursing). At this meeting Miss Elizabeth L. Smellie brought greetings from Canada. Another interesting paper was that given by Miss Dorothy Deming, Director of the National Organization for Public Health Nursing, her subject being "The Public Health Nurse as a Means to Implement the Cancer Program". Another important meeting considered the co-ordination of educational programs for all health workers. The supervision of public health nurses, viewed as a continuous educational program, was discussed from the point of view of the city agency and the rural agency. Changes in public health nursing functions implied in recent advances in medicine were outlined by Dr. Iago Galdston, secretary of the Medical Information Bureau of the New York Academy of Medicine.

The appointment of Miss Elizabeth Smellie as First Vice-president of the Association was a source of much pleasure to nurses in Canada.

The next meeting is to be held in Detroit in October. It would seem wise for as many public health nurses as possible to attend, for in no better way can a comprehensive picture of trends, procedures, and philosophies be obtained in such a short time.—*Elsie Hickey, Reg.N., Director of Public Health Nursing, Department of Public Health, Toronto.*

Appointments

THERE have been three new appointments of social service nurses to the venereal-disease clinics in Ontario.

Miss Rossie Densmore, a graduate of the Plummer Memorial Hospital, Sault Ste. Marie, 1921, and the post-graduate course in public health nursing at the University of Michigan, Ann Arbor, 1930, has succeeded Miss Gertrude Way who joined the staff when the clinic opened in 1922. Miss Way resigned on account of illness.

At Sudbury Miss Mary Schaffter, a graduate of Birkenhead General Hospital, England, 1933. and the University of Toronto public health nursing course, 1937, succeeded Miss Antoinette Chevrefils in November.

At the Fort William clinic Miss Audrey Turner, a graduate of the Ontario Hospital School of Nursing, Brockville, 1934, and the University of Toronto public health nursing course, 1939, has replaced Miss Gladys Young.

DR. G. F. AMYOT, D.P.H., APPOINTED PROVINCIAL HEALTH OFFICER OF BRITISH COLUMBIA

ON January 1, 1940, Dr. Gregoire Fere Amyot, D.P.H., was appointed Secretary to the Provincial Board of Health of British Columbia and Provincial Health Officer, succeeding the late Dr. H. E. Young.

Dr. Amyot is well known as one of the outstanding younger men in public health work in Canada. He has carried forward the high reputation of his father, Dr. John A. Amyot, who is internationally known in public health work. Dr. Amyot's medical studies were interrupted during the last Great War by service overseas. On returning, he did pioneer work under the direction of the late Dr. M. M. Seymour, Commission of Public Health of Saskatchewan, at Ile à la Crosse in the far north of the province, for a period of three summers and two winters. Deciding on public health as his career, Dr. Amyot took the postgraduate course in the University of Toronto, receiving the Diploma in Public Health in 1930. He was then appointed director of the North Vancouver Health Unit in British Columbia, which was then being established. For six years he directed the work of this unit, being relieved from these duties in May, 1936, to serve as Advisor on Hospital Services and Assistant to the Provincial Health Officer. At that time the Metropolitan Health Committee for Greater Vancouver was being formed and Dr. Amyot contributed largely to the successful completion of this project. In January, 1938, Dr. Amyot accepted an invitation to serve for two years on the field staff of the American Public Health Association to undertake surveys of state health administration in association with Dr. Carl Buck. Last fall he was asked to serve as a special member of the Faculty of Preventive Medicine at the University of Minnesota, and it was from this position that he returned to British Columbia. It is a source of great pleasure to Dr. Amyot's many friends in Canada that he is again in public health work in the Dominion.

BOOKS AND REPORTS

A Classified List of Diagnoses for Hospital Morbidity Reporting. *Welfare Council Publications 1939—IX. Published by the Research Bureau and Welfare Council of New York City, 44 East 23rd Street, 1939. 28 pages. 50 cents.*

This CLASSIFIED LIST OF DIAGNOSES FOR HOSPITAL MORBIDITY REPORTING is the first publication by the Welfare Council of New York City arising out of the study of hospital discharges in New York City which was begun in 1934. This study involved 576,623 patients discharged from 113 hospitals in New York City. Data included in the study comprised 24 items, the central point of which

was the medical diagnosis. The final results of the study will be published in two volumes at a later date.

The construction of a list of causes of illness is one of the first requisites in any morbidity study. The preparation of the list presented in this publication was one of the main objectives of the original undertaking which was designed to aid in the promotion of morbidity reporting in New York City. The method adopted in arriving at the list in its present form is indicated in the text, the basis being the Standard Classified Nomenclature of Disease, the most authoritative statement of medical nomenclature in existence.

The List is divided into fifteen groups with sub-headings totalling 443 items. This number appears to be small enough to be generally satisfactory and the scientific basis of selection of items for inclusion in the list guarantees a presentation of the *essential* data for those interested in hospital morbidity. Special groups with specialized interests will naturally desire greater detail in certain sections of the scheme.

If the principles involved in the drafting of the International List of Causes of Death are recognized as acceptable by those interested in morbidity statistics, it seems reasonable that the major groups should be retained and, unless absolutely contraindicated, the diseases, conditions or injuries included within the various major groups should be the same. This is not uniformly true of the List reported upon although the exceptions are admittedly few.

This development is of particular interest to Canadians in view of the national morbidity classification prepared by a Committee appointed by the Dominion Council of Health and tabled in 1938. Tremendous strides have been made in the last three years in Canada in the securing of information on the causes of illness. The attention of readers is therefore drawn to this publication as an authoritative source based on the largest scientific piece of work of its kind yet undertaken in America.

A. Hardisty Sellers

The Natural History of Population. *By Raymond Pearl. Published by the Oxford University Press, Toronto, 1939. 416 pages. Price $3.25.*

THE NATURAL HISTORY OF POPULATION contains a refreshing and thoroughly scientific treatment of the subject by one whose valuable researches in this field deserve careful study. The real cream of the book comprises the essential findings of studies in human fertility which by Dr. Pearl's own admission have been a major object of his interest and effort for many years. No pretence is made that this text exhausts the subject or presents all the pertinent material which is available. Indeed, it is planned to supplement this publication with another one at a later date.

What are the chief changes taking place in population? What factors are at work and what is the relative importance of each? What relation have these factors to modern attitudes and present population problems? These are some of the broad general questions to which this book provides a material basis for at least tentative answers. It is, of course, futile for any one to express dogmatic opinions because of the multiplicity of factors involved but the presentation of a considered opinion based on scientific research is extremely valuable at this time.

From a thorough examination of available population data supplemented by a rather unique and remarkable study of human fertility this broad conclusion emerges: "If it were not for the effect of contraceptive efforts and the practice of criminal abortion, together with correlated habits as to postponement of marriage, there would apparently be little or no significant differential fertility as between economic, educational, or religious classes of urban American married couples." This result is the

more striking because it indicates "that in one population at least the existing fertility differentials do not rest upon deeply rooted, innate biological differences. Instead, the responsibility for them appears to rest primarily, overwhelmingly, and directly upon that body of doctrine and practice popularly called birth control."

In presenting the material in the text, the author has dealt in succession with the biological background of population, the biology of fertility and human and animal reproductive patterns. These three sections are followed by a discussion of the extent of contraceptive efforts in the American population and the effects of these on natural fertility as indicated by research. In a final section the author summarizes the essential findings and offers some comment on world population—past, present and future. Appendices to the text contain the more detailed tables and a summary of the procedure in collecting the fertility data under discussion. An exhaustive bibliography is appended.

Students of population will welcome this book. It is indeed a valuable addition to the literature on the subject.

A. Hardisty Sellers

A Pediatrician in Search of Mental Hygiene. *By Bronson Crothers. Published by The Commonwealth Fund, New York. 271 pages. $2.00.*

THIS interesting book is divided into three parts: Mental Hygiene in the Practice of Medicine, Mental Hygiene in the Teaching of Medicine, and Towards Meeting the Paediatrician's Responsibility. The purpose of the book is to explain the opportunities open to the paediatrician to utilize the advances of the mental hygiene movement in private practice. The author begins by describing his own efforts and then explains the difficulties which tend to confuse the doctor interested in mental hygiene. The status of paediatrics as a specialty is discussed with emphasis on the important new field—the study of the mental or emotional factors of patients. In the author's view, a useful type of mental hygiene of childhood can be employed by the paediatrician in his practice, although there are other workers engaged in mental hygiene, viz. teachers, psychologists, the personnel of the mental hygiene clinics, the psychiatrist in private practice and the non-medical worker with a training in child guidance.

In Part II the need for paying attention to the "art" as well as to the "science" of medicine is pointed out, for the latter has made more rapid strides than the former during the past 25 years. The study of the environment, social and housing conditions, and economic stresses of the sick patient has led to the development of the hospital social service department as an aid in treatment. In this way the value of the trained, medical, social service worker has been recognized. Similarly, the relation of behaviour to physical disease is becoming apparent and hence the importance of developing a skilled worker, without medical training, but possessing a knowledge of psychiatry and social science.

The problem of the effective introduction of the study of behaviour in a children's hospital is discussed, since behaviour is certainly an element to be considered in many of the cases attending the clinic. A child guidance clinic tends to be isolated in the administration of a hospital and is apt to be used by outside agencies in the solution of school and social problems.

Part III suggests a scheme for the development of a "specific paediatric art" on the basis of a recognition of the psychiatric components of different case-groups. The results of an enterprising experiment at the Boston Children's Hospital are reviewed and Dr. Crothers is satisfied that education and medicine are both involved in paediatrics. Although the hospital is well-equipped for the examination

and treatment of physical ailments, less attention is now paid to organic neurology and a more detailed study made of behaviour problems among children brought to the hospital.

The author has written a stimulating book, in which there is much food for reflection.

J. Wyllie

The Placing of Children in Families. *Vol. 1: Fundamental Concepts, Historical Development, Characteristic Features in Differing Systems, Principles and Procedures in the Organisation of Services. Vol. 2: Various Systems of Placing Children in Families. Published by the League of Nations, 1938. 154 and 241 pages. 3s, 6s. Obtainable from the League of Nations Society in Canada, 124 Wellington St., Ottawa.*

THE PLACING OF CHILDREN IN FAMILIES comprises the results of a world study of the subject made by a sub-committee of the Committee on Social Questions under the League of Nations. Much of the work undertaken was planned in Canada on the basis of Canadian experience. The origin of the work is of interest. Originally conceived as part of a general enquiry by the Child Welfare Committee into the treatment of neglected and delinquent minors, it was found that the question could not be confined to this limited aspect and the Advisory Committee decided to treat independently the whole problem of placing in families as a method of child care.

The project was initiated in 1935 by questionnaire and the two volumes comprising a report on the work, contain material submitted by governments and child welfare organizations throughout the world. Miss Charlotte Whitton and Mr. Robert E. Mills, Director of the Childrens' Aid Society of Toronto, both played a significant part in the undertaking.

The first volume presents the principles accepted by modern social service as underlying provisions for child care. The historical development of the use of placing children in families, characteristic features of the different systems employed in the various parts of the world and the organization of social service to direct such work are discussed. The report defines the principles from which important practises in social welfare proceeds.

In volume 2 are described the various systems of placing children in families that are now employed in different parts of the world. In all, 26 countries are covered.

The conclusions derived from the study are presented in volume 1 under the heads: Principles and Objectives, and Standards in Administration and Service. These may well serve as a basis of standards in the whole problem of child placing.

A. Hardisty Sellers

CURRENT HEALTH LITERATURE

Treatment of Pneumococci Pneumonia: A Comparative Study of 351 Patients Treated at the Philadelphia General Hospital

IN this investigation, 351 adult patients (1938-1939) with typed pneumococcic pneumonia were studied, the organism being recovered in all cases from either the sputum or the blood stream. The patients were classified as to whether they received non-specific treatment, serum therapy or sulphapyridine. The largest number of cases, namely 95, had type I pneumonia. The mortality in type I cases who were given sulphapyridine was 3.3 per cent and in those given serum therapy 11.1 per cent. In the type II group, 31 patients were observed and the mortality rate in those given sulphapyridine was 4.5 per cent. and in those given serum therapy 16.7 per cent. The non-specifically treated patients in these groups represented those of advanced resolution on admission. There were 57 patients with type III pneumonia, 16.2 per cent. of the entire study.

Serum was not available for these patients and a mortality of 21.9 per cent. was recorded in those who received sulphapyridine. The higher types of pneumonia were too few to be of statistical significance.

Reactions occurred with the serum-treated patients in five instances. Nausea occurred in 85 per cent. and vomiting in 52 per cent. of the patients treated with sulphapyridine.

The total mortality rate of this series was 12.5 per cent. as compared with 35 per cent. in the preceding three years.

Leon Schwartz, Harrison F. Flippin, and Wm. Turnbull. Ann. Int. Med., 1939, *13*: 1005.

Record of a Food-poisoning Outbreak: The Role Played by Ice

THE occurrence of an epidemic of food poisoning in the hot summer months due to *S. typhi murium* is not unusual, but in this report the role played by ice is of particular interest. The outbreak recorded deals with the investigation of eighteen diners on a train who presented symptoms of food poisoning. From eight of nine stool specimens obtained *S. typhi murium* was isolated. The remaining patients had mild symptoms only and were not admitted to hospital.

From the various foods which might possibly be incriminated, *S. typhi murium* was isolated from roast veal and green beans. The organism was also recovered from the remainder of the ice in the ice-chest used for preserving the food. Investigation revealed that it was customary for the more perishable food stuffs to be placed in the ice-chest. Analysis of the information available led to the logical explanation that the roast veal, as in many other food-poisoning outbreaks, was the most likely source of infection and that the ice had become secondarily infected. To support this reasonable hypothesis, many interesting experiments were subsequently carried out with pieces of crystal-clear, flawless ice. A hair-like system of canalization rendered more visible with the aid of a lens and with methylene and fucsin dyes was demonstrated. It was conclusively shown that such pieces of ice could be inoculated with *S. typhi murium*, subsequently melted, and from the ice-water resulting the organism could be recovered. Applying this phenomenon to the outbreak recorded, it was reasonable to assume that the ice became contaminated from the infected veal which presumably had been preserved on the ice along with other food-stuffs. There is no explanation why other food-stuffs similarly placed in the ice-chest did not become contaminated.

George Buchanan and C. DeV. Bevan, South African J. M. Sc., 1939, *4*: 111.

Active Immunization Against Tetanus

IN this study, thirty-two healthy persons between the ages of 14 and 28 years were actively immunized against tetanus by the administration of one of three antigenic preparations: tetanus toxoid (plain), tetanus toxoid (plain) to which 0.4% phenol was added, and alum-precipitated tetanus toxoid. The blood sera were titrated before and after immunization and the results of the three preparations compared.

It was found that two injections of alum-precipitated tetanus toxoid produced a higher antitoxin titre than three injections of plain toxoid or plain toxoid to which phenol was added. Following the basic course of immunization, there is a variable loss of immunity necessitating a reinforcing, repeat or stimulating dose of tetanus toxoid at the time of injury. This will raise the antitoxin titre within 4 to 6 days to a desired level of antitoxic immunity far beyond that produced by the passive immunization of 1,500 units of tetanus antitoxin. This level is maintained for a longer period of time than is the case after the basic course of immunization. Finally, the reactions experienced by individuals are for the most part mild and localized with only a rare systemic reaction being encountered.

H. Herman Gold. Ann. Int. Med., 1939, *13*: 768.